

# Model 250

RECORDER/MIXER

## Owner's Manual

"The ideal self-contained  
recording studio for  
today's performing artist"



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## SAFETY INSTRUCTIONS

### WARNING

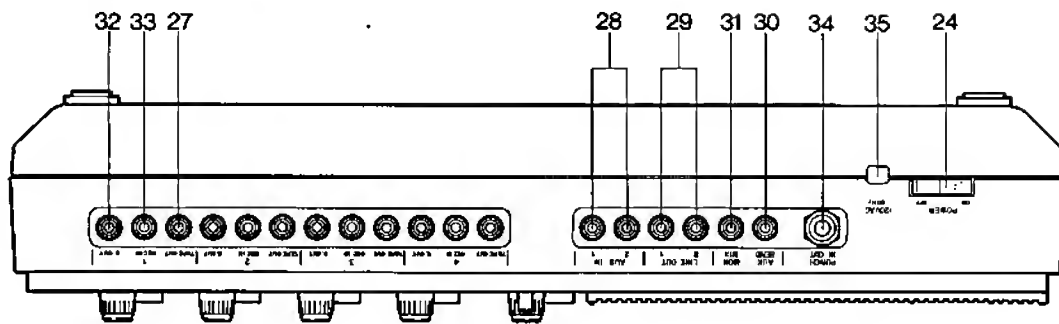
#### "READ BEFORE OPERATING"

1. Read Instructions—All the safety and operating instructions should be read before the appliance is operated.
2. Retain Instructions—The safety and operating instructions should be retained for future reference.
3. Heed Warnings—All warnings on the appliance and in the operating instructions should be adhered to.
4. Follow Instructions—All operating and use instructions should be followed.
5. Water and Moisture—The appliance should not be used near water—for example, near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, etc.
6. Ventilation—The appliance should be situated so that its location or position does not interfere with its proper ventilation. For example, the appliance should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or, placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.
7. Heat—The appliance should be situated away from heat sources such as radiators, heat registers, stoves, or other appliances (including amplifiers) that produce heat.
8. Power Sources—The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.
9. Power-Cord Protection—Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.
10. Cleaning—The appliance should be cleaned only as recommended by the manufacturer.
11. Nonuse Periods—The power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.
12. Object and Liquid Entry—Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.
13. Damage Requiring Service—The appliance should be serviced by qualified service personnel when:
  - A. The power-supply cord or the plug has been damaged; or
  - B. Objects have fallen, or liquid has been spilled into the appliance; or
  - C. The appliance has been exposed to rain; or
  - D. The appliance does not appear to operate normally or exhibits a marked change in performance; or
  - E. The appliance has been dropped, or the enclosure damaged.
14. Servicing—The user should not attempt to service the appliance beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

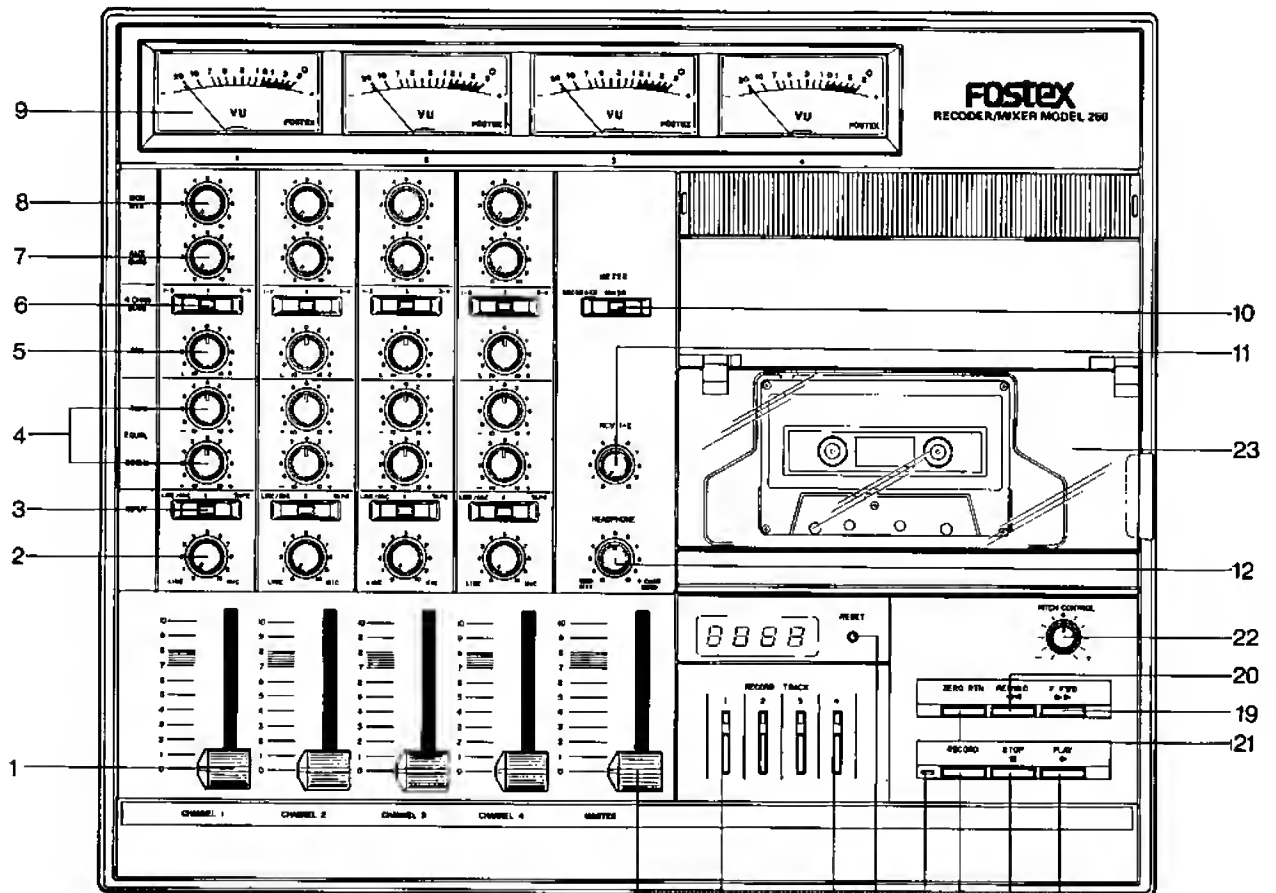
**WARNING: To avoid possible electric shock hazard, do not expose this appliance to rain or moisture. There are no user serviceable parts inside. Refer servicing to qualified service personnel.**

# SECTION 1 CONTROLS, INDICATORS & CONNECTORS\*

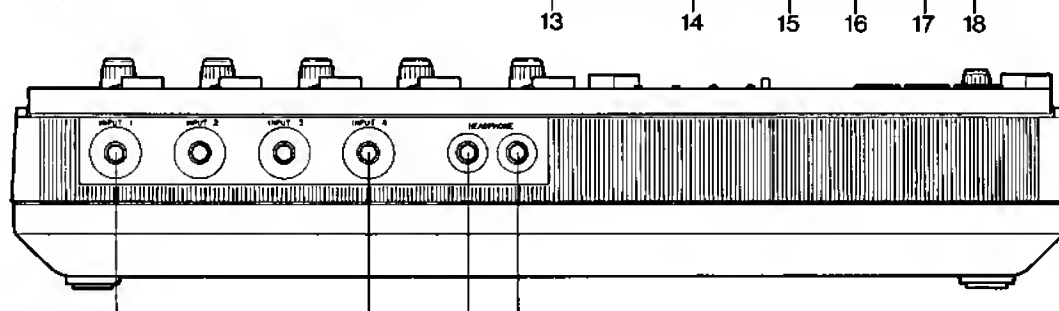
Figure 1 Model 250 Panel Features



Rear Panel



Main Panel



Front Panel

## MAIN PANEL FEATURES

### Input Channel (same features for channels 1 through 4)

#### 1. INPUT FADER

This slide fader controls the signal level from either of two sources, the channel's input jack or playback from the built-in cassette recorder, depending on the position of the INPUT selector (LINE/MIC-TAPE) switch [3]. To ensure low distortion and preserve an optimum signal-to-noise ratio, the Input Fader should be set in the range between #7 and #8 on the scale (nominal position). When the INPUT selector switch [3] is in LINE/MIC position, the LINE-MIC (preamp trim) control [2] also affects the channel level.

#### 2. LINE-MIC (PREAMP TRIM) CONTROL

This rotary control continuously adjusts the preamplifier gain over a 50 dB range. In LINE position, the preamp has 0 dB gain (unity), which means the channel input is suitable for use with nominal -10 dB (0.3 V rms) line levels such as the output of electronic musical instruments and tape recorders. As the control is rotated toward MIC position, the gain increases by 50 dB, making the input suitable for use with nominal -60 dB (1 mV rms) levels such as the output of a dynamic microphone. Intermediate settings are suitable for such signal levels that might be obtained from condenser microphones, guitar pickups, and so forth.

This control has no effect when the INPUT selector (LINE/MIC-OFF-TAPE) switch [3] is set in TAPE position.

*\*NOTE: Each feature in this section is referenced by a numbered callout and a correspondingly numbered description. When a feature is mentioned, its callout number may be cited in brackets (e.g., the LINE-MIC control [2]).*

#### 3. INPUT SELECTOR (LINE/MIC-OFF-TAPE) SWITCH

This 3-position lever type switch selects the signal which is applied to the input FADER, as explained below:

**LINE/MIC:** Signal is applied to the FADER (line to mic level) via the front panel INPUT phone jack, and a preamplifier. The #1 INPUT jack (front panel) goes to the #1 input FADER, etc.

**OFF:** No signal is applied to the input FADER, so the channel is effectively shut off.

**TAPE:** Tracks 1 through 4 of the built-in cassette recorder are connected to the correspondingly numbered input channels as follows:

a) When the track is not recording, the playback signal is applied to the input FADER.

b) When a given track is actually recording, record input signal is present at the input FADER.

#### 4. EQUALIZER (300 Hz & 4 kHz)

The channel's two EQUALIZER knobs (300 Hz & 4 kHz) provide approximately 12 dB of the shelf type boost or cut at a turnover of 300 Hz; and boost or cut at a center frequency of 4 kHz. Center position (12 o'clock) provides a flat response. The 300 Hz knob controls bass frequencies, while the 4 kHz knob affects mid-range to higher frequencies.

#### 5. 4 CHAN BUSS PAN POT (L-R)

The input signal, after the FADER and EQUALIZER, is applied to this PAN pot, labelled L-R. PAN then applies the signal to a pair of record tracks, either 1 and 2 or 3 and 4, based on the setting of the 4 CHAN BUSS selector (1-2/OFF/3-4) switch [6].

Center PAN position (12 o'clock rotation) applies equal signal to both selected tracks. As the PAN pot is rotated counterclockwise, it applies about 3 dB more signal to track 1 (or 3) and virtually eliminates the signal applied to track 2 (or 4). The opposite occurs when the PAN pot is rotated clockwise.

*NOTE: The 4 CHAN BUSS pot may be bypassed, and the input can be applied directly to one (or more) record tracks by connecting a cable from the channel DIRECT OUTPUT to the desired RECORD INPUT(s), and setting the 4 CHAN BUSS selector (1-2/OFF/3-4) [6] to OFF position.*

*NOTE: When recording or overdubbing one track at a time, it is recommended that this pan pot be set fully to one side or the other in order to apply all the channel's signal to a single track. Panning to intermediate positions is generally used during mixdown, at which time*

*two tracks are assigned as a stereo pair (e.g., tracks 1 and 2), and the pot then pans the signal left, right, or anywhere in between. This can also be done when recording original stereo tracks, or when overdubbing in stereo.*

#### 6. 4 CHAN BUSS SELECTOR (1-2/OFF/3-4) SWITCH

This lever type switch determines whether the channel's 4 CHAN BUSS PAN pot [5] applies signal to recording busses 1 and 2 or to busses 3 and 4. The switch is off in mid position, which means that no signal from the PAN pot is applied to any recording buss.

#### 7. AUX BUSS

This control feeds the input channel's post-fader and post equalizer signals to a summing amplifier that mixes the Aux Sends of all four input channels for feed to the Aux Send jack. This mono mix may be used to feed external auxiliary signal processing equipment.

#### 8. MONMIX

This controls the recorder output signal fed to the summing amplifier. All four recorder output channels are mixed into mono by the summing amplifier for feed to the MONMIX jack.

This mono MONMIX signal is generally used as a cue signal to the musicians.

The recorder's four channel outputs will be derived from the tape out signal when in the play mode, and record input signal when in the record mode.

#### VU Meters and Meter Selector

##### 9. VU METERS

The four VU meters are identical, illuminated meters with standard VU ballistics (meter levels relate to the perceived loudness). A red LED in the corner of each meter illuminates when the instantaneous peak level approaches the clipping point, providing a better means to avoid distortion than the slower-responding meter.

Typical meter readings should peak at from -3 VU to 0 VU, although percussive or plucked instruments may require lower average readings in order to avoid distortion during the initial high-level transient. As a rule, occasional flashes of the LEDs are acceptable, but levels should not be so high as to cause frequent flashing or continu-

ous LED illumination.

Meters 1 through 4 monitor record and playback levels on their respective tracks when the METER selector is set to RECORDER position. However, the four meters monitor the 4 CHAN BUSS OUT's when the METER selector is set to MIXER position.

The 1 and 2 meters can also monitor the LEFT and RIGHT of LINE OUT levels, respectively, depending on the setting of the METER function switch [10].

#### 10. METER FUNCTION SWITCH (RECORDER-MIXER)

All four meters will monitor the signals determined by the METER selector switch, as explained below:

**RECORDER:** Indicates recorder's output levels as follows: the Record input of those channels in the record mode, and the tape output of those channels in the play mode.

**MIXER:** Indicates 4 CHAN BUSS OUT levels from the mixer section. Although all four channel buss outputs are applied to the recorder, channels 1 and 2 are also fed to the rear panel LINE OUT 1, 2 jacks, and therefore meters 1 and 2 also monitor the LINE OUT's.

#### Aux Receive 1-2 and Headphone Level

##### 11. AUXILIARY RECEIVE LEVEL CONTROL (RCV 1-2)

This control simultaneously adjusts the level from both the LEFT and RIGHT AUX IN Jacks [28]. The signals are then applied to BUSS CHAN 1 and BUSS CHAN 2 of the 4 CHAN BUSS, ahead of the MASTER 1-2 fader (13). When AUX IN is used for effects return, this control adjusts the proportion of effect (e.g., reverb or echo) to "dry" signal. When AUX IN is used as a sub input from another mixer or remote feed, the RCV 1-2 control serves as a sub master for the remote mix. If possible, it is recommended that RCV 1-2 initially be set at #7 and the output level from the effects unit or other mixer be set for proper balance and low distortion; if it is not practical to adjust the incoming level,

set RCV 1-2 as required.

##### 12. HEADPHONE LEVEL

The headphones are OFF when the knob is at center (12 o'clock). CCW rotation of the control allows monitoring of the MONMIX signal in the left and right headphones at equal levels.

The 4 CHAN BUSS signals can be monitored in stereo by rotating the control clockwise. (Mixed signals of buss 1 and 3 are heard in the left headphone, and buss 2 and 4 in the right headphone.)

##### 13. MASTER 1-2 FADER

This MASTER FADER simultaneously controls the levels of both BUSS OUT 1 & 2 of the 4 CHAN BUSS. This FADER affects the following circuits:

- a) the LINE OUT 1 jack [29],
- b) the LINE OUT 2 Jack [29],
- c) the 1 and 2 meters [9] when the METER selector [10] is set to MIXER position.

#### Tape Transport Features

##### 14. RECORD TRACK SELECTOR BUTTONS (1-4) AND INDICATORS

These four push buttons and LEDs are numbered to correspond with the four tracks on the cassette tape. When a button is depressed, its track is "record ready," as indicated by a blinking LED above the RECORD TRACK button. Recording will not actually begin until either:

- a) the RECORD button [16] and PLAY button [18] are simultaneously pressed, or
- b) the PLAY button [18] is pressed and then the REMOTE FOOT SWITCH (PUNCH-IN/PUNCH-OUT) is actuated.

There is one exception; when depressing a RECORD TRACK selector button immediately results in recording: when the RECORD and PLAY buttons have already been pressed so that the transport is rolling tape (and the red LED left of the RECORD button is blinking, then depressing a RECORD TRACK Selector switch will cause the track to enter record mode.

The LEDs show the status of the associated tape tracks as follows:

**UNLIT:** Track is in "safe" mode and will not record even if RECORD and PLAY buttons are pressed.

**BLINKING:** Track is in "record ready"

mode, and will record as soon as the RECORD and PLAY buttons are pressed (or PLAY and then REMOTE PUNCH-IN).

**STAYS ON:** Track is recording.

##### 15. TAPE INDEX COUNTER AND RESET BUTTON

A 4 digit display accurately indicates relative tape position (by means of a photo-interrupter circuit on the transport takeup spindle). Pressing the adjacent RESET button sets the display at 0000. To take advantage of the ZERO RETURN function [21], it is recommended that the RESET button be pressed at the beginning of a "take," especially when overdubbing or making inserts.

##### 16. RECORD BUTTON AND INDICATOR

The effect of pressing the RECORD button will vary, depending upon the status of certain other controls. The adjacent LED helps to signal the status, as explained below:

- (a) If you press RECORD while tape is stopped:

The RECORD MODE LED adjacent to the RECORD button blinks. Should any of the four RECORD TRACK selector buttons [14] be depressed, TAPE OUT and MONMIX from that channel automatically change from the reproduce amplifier to the record input signal. Then as soon as either the PLAY or STOP button is depressed the LED turns off, and the SYNC signal returns to the reproduce amplifier.

- (b) If you press RECORD and PLAY at the same time:

If none of the four RECORD TRACK selector buttons [14] is depressed, the RECORD MODE LED adjacent to the RECORD button blinks, and tape is transported in play mode. The unit is "record ready," however, and should any RECORD TRACK selector button be depressed, its track will immediately enter record mode.

If one or more RECORD TRACK selector buttons is already depressed when the RECORD and PLAY buttons are pressed, the corresponding track (or tracks) will enter record mode. The RECORD MODE LED next to the RECORD button will be illuminated, as will be the RECORD TRACK LED for any track that is recording.



(c) If you press PLAY on the control panel, and subsequently press the REMOTE FOOT SWITCH (PUNCH-IN/PUNCH-OUT):

Until the first time the REMOTE FOOT SWITCH is actuated, which puts the unit in the RECORD mode, the transport will be in play mode (after the second actuation of the switch, the unit returns to this mode). After the REMOTE FOOT SWITCH has been actuated once, the transport will behave as though the RECORD and PLAY buttons had been pressed simultaneously, as in (b) above, and sequentially alternate between RECORD and PLAY modes with each depressing of the FOOT SWITCH.

## 17. STOP BUTTON

Depressing the STOP button cancels any transport function and stops tape motion. (Whether tape is moving due to ZERO RETURN, REWIND, F. FWD, RECORD or PLAY, tape motion will stop.)

## 18. PLAY BUTTON

Depressing the PLAY button places the transport in play mode, advancing tape onto the takeup reel (from left to right) at a constant speed of 3-3/4 ips (9.5 cm/s), plus or minus any deviation set with the PITCH control [22].

## 19. FAST FORWARD BUTTON (F. FWD / >>)

Depressing this button cancels any other transport function and causes the tape to wind onto the takeup reel (from left to right) at high speed. If the transport had been in rewind or ZERO RETURN mode, tape will first stop momentarily, then begin forward winding.

## 20. REWIND BUTTON (<<)

Depressing this button cancels any other transport function and causes the tape to wind onto the supply reel (from right to left) at high speed. If the transport had been in fast forward or play mode, tape will first stop momentarily, then begin rewinding.

## 21. ZERO RETURN BUTTON

Depressing this button cancels any other transport function and causes the tape to wind onto the supply reel (from right to left) at high speed until the INDEX COUNTER [15] displays 0000,

at which point the tape automatically stops. If the transport had been in fast forward or play mode, tape will first stop momentarily, then begin rewinding to 0000. If the transport had been in rewind mode, it will continue rewinding until the counter displays 0000.

## 22. PITCH CONTROL

This control can be used to vary the constant tape winding speed by  $\pm 10\%$  during record or play modes. For a nominal 3-3/4 ips (9.5 cm/s) tape speed, center the control (it will "click" into position). Turning the knob CCW decreases tape speed, and turning it CW increases tape speed.

## 23. CASSETTE WELL AND COVER

A transparent plastic cover protects the cassette during operation. To insert or remove a cassette, open the cover by placing a finger under the recess on the right edge of the main panel and lifting up. Observe that the raised edge of the cassette (where the tape is visible) should face the front of the cassette well.

*NOTE: Use C-60 or C-90 cassettes (not C-120). The bias and tape equalization are suitable for gamma ferric oxide tape that requires high bias level and 70 microsecond EQ. For optimum results, use only this type of tape (e.g., TDK-SA, MAXELL UD XL-II, or equivalent).*

## 24. POWER SWITCH

Actuating this switch, located at right of the rear panel, turns on the power to the mixer electronics and the tape transport. The VU meter faces will be illuminated if power is on and the unit is plugged into a "live" AC outlet.

# FRONT PANEL FEATURES

## Front Panel

### 25. CHANNEL INPUT (MIC/LINE) JACKS (applies to 1 through 4)

This standard phone jack accepts any low or high impedance, unbalanced input from nominal  $-60$  dB (mic) to  $-10$  dB (line), depending on the setting of the channel's LINE/MIC trim control [2]. The jack is "live" only when the channel's INPUT selector switch [3] is set to LINE/MIC position.

## 26. HEADPHONE JACKS

### (two stereo phone jacks)

Two stereo HEADPHONE jacks are provided (parallel wired) so that two pair of phones may be used at once. Rated for 8 ohm or higher impedance phones, these outputs carry the signal from the MONMIX. The operator can use one jack to monitor the mix, and a performer can use the other for cues during overdubs and inserts.

# REAR PANEL FEATURES

## Rear Panel

*NOTE: All rear panel input and output jacks (except the REMOTE PUNCH-IN/PUNCH OUT foot switch phone jack) are unbalanced phono jacks (RCA type pin jacks). They operate at nominal  $-10$  dBV levels (0.3 Vrms). Inputs accept low or high impedance sources; outputs are intended to drive high impedance loads. These levels and impedances are compatible with most line level mixers, tape recorders, power amplifiers, and signal processors or effects devices. Refer to Section 9 for additional interface information.*

## 27. TAPE OUT JACKS

### (applies to 1 through 4)

These jacks carry an output corresponding to the tape track of the same number (e.g., track 3 appears at jack #3). These output signals will be the record input signals (4 CHAN BUSS OUT) when the transport is in record mode, and tape out signals (sync) when in the play mode.

In other words, the playback signals are output here when the RECORD TRACK button is depressed, then change to the record input signal when the transport is put in the record mode.

## 28. AUX IN JACKS (AUX 1 and 2)

These jacks apply a stereo signal to RCV 1-2 ahead of the MASTER 1-2 FADER [13]. The signal levels applied to CHAN 1 and CHAN 2 of the 4 CHAN BUSS are adjustable by means of the RCV control [11].

## 29. LINE OUT JACKS (LINE OUT 1-2)

These jacks carry the output from the BUSS CHAN 1 and BUSS CHAN 2 of the 4 channel buss. The LINE OUT signal level is adjustable by means of the MASTER 1-2 FADER [13]. The LINE

OUT jacks can be used during remix for transferring the mixed program to a stereo recorder. They also are useful for driving a control room monitor amplifier during recording or overdubbing.

### **30. AUX SEND JACK (monophonic)**

This jack carries a mono mix of the four input channel signals, as determined by the setting of their AUX SEND controls.

This output is a post-EQ and post-input fader controlled signal and can be sent to external auxiliary signal processing equipment such as a compressor, a graphic equalizer, an echo or delay unit, or a reverb.

### **31. MONMIX JACK (monophonic)**

This jack carries the mono mix signals of the recorder's four channel outputs which are individually level set by the four MONMIX controls before being mixed into mono.

Depending on whether a particular track is in record mode or play mode, the MONMIX signal will be either: the record input signal (4 CHAN BUSS) in record mode, or tape out signal in play mode.

The MONMIX signal is used for cue feed to the musicians (with an external amplifier) or may be used for echo send.

### **32. DIRECT OUT JACKS**

**(applies to 1 through 4)**

These jacks carry the output from correspondingly numbered input channel equalizer, just ahead of the 4 CHAN BUSS PAN control. They can be used to drive external effects devices, and the return from such devices can be brought to the AUX IN jacks [28], another channel's INPUT jack [25], or a RECORD IN jack [33]. Any DIRECT OUT jack can be patched directly to any RECORD IN jack [33], thus bypassing the 4 CHAN BUSS selector switch [6] and PAN control [5].

### **33. RECORD IN (REC IN) JACKS**

**(applies to 1 through 4)**

These jacks apply signals to the correspondingly numbered tracks of the cassette recorder.

### **34. REMOTE FOOT SWITCH**

#### **(PUNCH-IN/PUNCH OUT) JACK**

This phone jack accepts the cable from the unit's REMOTE FOOT (PUNCH-IN/PUNCH OUT) SWITCH. When the unit is in play mode, pressing the FOOT SWITCH once will cause it to enter record mode (if any RECORD TRACK button [14] is engaged), or record ready mode (if no RECORD TRACK button is engaged). The FOOT SWITCH makes it possible for a performer to play an instrument or handle music while operating the recorder; even if the person is not simultaneously performing, the foot switch can free a hand to operate a fader, EQ, or other controls when recording initial tracks, or doing inserts and overdubs.

### **35. AC POWER CORD**

First make sure the unit's POWER switch [24] is off. Then plug this cord into a suitable AC power outlet (check the specifications for the proper line voltage and frequency).

## SECTION 2 INTRODUCTION

The Fostex Model 250 incorporates a 4 input x 6 output mixer and a 4 track, 4 channel cassette tape recorder—a complete recording system (less microphones, monitor amp and speakers) in a lightweight, compact housing. With the very portable Model 250, setting up an “instant” recording studio is as easy in a hotel room or at a friend's place as it is at home. The system is ideal for making original multi-track recordings, overdubbing, and mixing down to stereo. The Model 250 provides many alternate signal flow paths, thanks to a variety of assignment switches, pan pots and auxiliary in/out jacks. This not only provides creative flexibility, it also enables the unit to serve as a back-up mixer for simple sound reinforcement applications.

Live instruments and vocals tend to generate high instantaneous peak levels, and sometimes low average levels, both of which tax the limits of the mixing and recording equipment. These extremes—the difference between maximum undistorted recording level and the noise floor—constitute the *dynamic range* of the program. In commercial recordings and broadcasts, such extremes in dynamics have already been compressed by a variety of signal processing. This is why consumer tape recorders can yield acceptable results even though they offer limited dynamic range. When making live recordings, however, the ability to handle wide dynamics is far more critical. For this reason, Fostex engineers have given special attention to maximizing the dynamic range of the cassette recorder and of the mixing electronics.

The result is excellent audio performance, with wide bandwidth (wide frequency response), low distortion and low noise. To improve tape record/play performance, a new track/speed format has been adopted. Standard cassettes are utilized, but the tape head configuration and running speed are modified for optimum four-channel operation.

### HOW 250 RECORDINGS DIFFER FROM STANDARD STEREO CASSETTES

The tape records or plays all 4 tracks in the same direction at 3-3/4 ips (9.5 cm/s), two times conventional cassette speed, providing extended high frequency response and wider dynamic range. Additional dynamic range is afforded by the built-in Dolby\* Type C noise reduction system, an updated version of Dolby processing that yields approximately 20 dB of noise reduction and headroom extension.

The Model 250 track format is designed with consideration to improving sync crosstalk while maintaining interchangeability with the standard Phillips cassette format.

A tape recorded on tracks 1 and 2 of the Model 250 can successfully be played on those regular format cassette decks having a tape speed of 3-3/4 ips; a tape recorded at 3-3/4 ips can be put in the Model 250 for overdubbing, or a control signal can be recorded on one track for audio visual applications.

### USE THE PROPER TYPE OF CASSETTE TAPE

Fostex has engineered the Model 250 to operate with just one specific type of cassette: the tape should have a gamma-ferric oxide emulsion and should be rated for high bias

and 70 microsecond equalization. (This is the type of tape that uses the “chrome” position on many recorders, although not a chrome tape). There are several benefits in standardizing on one type of tape. Fostex is able to deliver the utmost performance, and high reliability, at a moderate price. Also, the user saves time when setting up to record or play a tape because there are no routinely required bias, EQ or level alignment procedures. Moreover, the majority of professional recording engineers choose to standardize on one tape so that they obtain consistently predictable results.

Metal tape was rejected because it would greatly increase operating costs without any major benefit (metal tape was first developed to extend high frequency response at low tape speeds, but the Model 250 is already running at twice normal speed). Metal tape also requires significantly higher record and erase bias, which would compromise track-to-track separation and erasure depth, both critical to overdubs. Chrome tape was not chosen because it can cause premature tape head wear, and because gamma-ferric oxide formulations afford virtually identical performance.

The gamma-ferric oxide tape specified is widely available (e.g., TDK-SA, Maxell UDXL-II, etc.). It yields high output, low noise, and extended high frequency response. While other tapes will function in the Model 250, performance will be degraded (the noise floor will be higher, maximum record levels may be lower, and frequency response may be uneven).

We recommend using only C-60 or C-90 cassettes which normally run 30 and 45 minutes a side, respectively. Since the Model 250 runs twice speed, and the tapes cannot be turned over, the usable time is 1/4 that suggested by the tape label, as shown on the following chart.

Cassette length	Running time in standard recorder at 1-7/8 ips	Running time in Model 250 at nominal 3-3/4 ips (Pitch control centered)
C-30	15 minutes per side, 30 minutes total.	7-1/2 minutes
C-45	22.5 minutes per side, 45 minutes total.	11-1/4 minutes
C-60	30 minutes per side, 60 minutes total.	15 minutes
C-90	45 minutes per side, 90 minutes total.	22-1/2 minutes
C-120	60 minutes per side, 120 minutes total.	NOT RECOMMENDED FOR USE WITH Model 250

If the running times seem short, remember these are master tapes; one side of an LP album seldom runs more than 22-1/2 minutes. Longer recordings can be built up during the remix, if desired, working from several Model 250 master tapes. C-120 cassettes are not recommended because they use a thinner tape backing (1/2 mil), and the many record/play operations necessary to create a master tape will tend to wear out or jam the more delicate tape. (Is it worth risking the hours of work spent creating a tape only to have it break, wear or jam in the final stages?) Use only premium quality C-90 or shorter tapes to be safe.



## USING THIS MANUAL

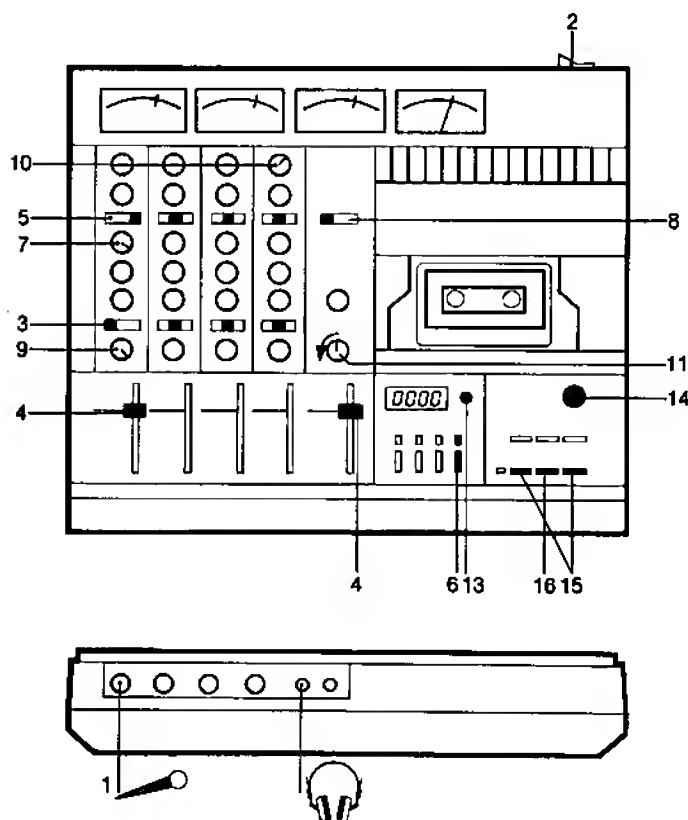
The balance of this manual is presented in a sequence of the basic steps one would follow to create a master tape: from recording the original tracks, to sync recording (overdubbing) and then mixdown (remixing). After that, combining tracks (ping-pong), stereo recording, and other peripheral topics are covered. If the reader is quite familiar with hooking up electronic systems, a look at the electronic specifications and block diagram in Section 11 will suffice. Otherwise, we recommend reading the front and rear panel descriptions in Section 1, and also the interface information in Section 9.

Most procedures are organized so they can be followed step-by-step. Accompanying diagrams are labelled to show those features associated with the numbered steps.

## SECTION 3 INITIAL RECORDING (CUTTING ORIGINAL TRACKS)

### PREPARING TO RECORD THE FIRST TRACK

Figure 2. Steps for initial recording with Model 250.



**NOTE:** *Cassette tapes must be smoothly and evenly wound for best results. Before loading a cassette into the Model 250, we recommend gently tapping the cassette on a flat, hard surface. This packs the tape uniformly against the bottom of its case. (Hold the cassette so the side facing up is the same side that will face up when the cassette is loaded.) To be extra certain of a uniform tape pack, fast wind a new cassette fully to one end, then rewind prior to use.*

1. Plug a signal source, such as a microphone or electric instrument, into channel INPUT jack # 1 on the front panel.
2. Turn on the POWER, open the cassette well cover (grip the cover at the cutout on the right edge of the case and lift), and insert a blank cassette.
3. Set the channel 1 INPUT selector switch to LINE/MIC position; on all other channels, set it to OFF position.
4. Set the channel 1 input FADER and the MASTER 1-2 FADER to the nominal zone (between # 7 and # 8 on the scale).

**NOTE:** *It is now necessary to decide which of the four tracks is to be recorded. In this instance, we will record the signal from input channel # 1 onto track # 4.*

5. Set the 4 CHAN BUSS selector switch to assign the input to the desired pair of tracks (in this example, use 3-4 position). On all other channels, set the selector to OFF position.
6. Depress the appropriate RECORD TRACK button; for this example, engage the # 4 button.
7. Turn the channel 1, 4 CHAN BUSS PAN pot fully clockwise (to R position), assigning all the input signal to the # 4 record buss.

**IMPORTANT NOTE:** *The PAN pot should be fully panned to assign all signal to the designated record buss (# 4 in*

this instance). The object at this point is to record on only one track of the tape at a time. If the PAN pot is set in some mid position, part of the signal is being assigned to an unused buss, which serves only to degrade the signal-to-noise ratio on the track being recorded (part of the signal is "wasted"). In some cases it is possible one could hear a signal in the headphones (or monitor speakers), even though that signal is not actually being recorded.

8. Set the METER function switch to RECORDER position so that VU METER # 4 will monitor the signal level from input channel 1 (as assigned to record buss # 4).

*NOTE: In order to adjust the TRIM (LINE-MIC) control, it will be necessary to provide an average level signal at the channel input. It is O.K. for you to sing, talk, or play an instrument, although during setup it will be easier to have a friend do this as you adjust the Model 250 controls. Alternatively, use a radio, phonograph record played over speakers, a continuous organ note, or any convenient sound that will stimulate a microphone at approximately the level of the ultimate sound source. After the setup is achieved and the actual performance is under way, the levels can be retrimmed slightly, as may be required.*

9. Begin with the TRIM control set fully CCW at LINE position. Then with a typical signal present at the channel input, adjust the trim control until the METER pointer peaks at from -3 VU to 0 VU (The TRK 4 meter in this example). The peak indicating LED in the meter face should flash only occasionally, if at all. Do not record at too low a level (e.g., -20 VU), as this will cause excess noise. If the peak LED flashes regularly with the VU meter topping at -3 to 0 VU, the sound source has a very high peak-to-average signal ratio (e.g., forte piano or plucked guitar). To avoid distortion, readjust the trim to reduce LED flashing, and accept the somewhat lower average VU level. (It may be desirable to use a compressor.)

*NOTE: The system is now adjusted for proper signal levels from the channel input, through the record electronics, and onto the tape. It is now appropriate to set up the monitor section; adjustments of HEADPHONE level do not affect the recording or VU levels.*

10. The MONMIX knob is set at # 7. This knob is located at the top of channel 4; the other MONMIX knobs are set full CCW.

*NOTE: Observe that the MONMIX controls associated with channel 4 are used, not channel 1. This is because the recording is occurring on track 4. Any one or more input channels can be assigned to track 4 (channel 1 was used here), but the playback from track 4 is accessible only by means of the MONMIX control of the channel numbered to correspond to the track (e.g., # 4).*

11. Initially set the HEADPHONE control at center (OFF), and plug a pair of 8-ohm or higher impedance stereo headphones into either HEADPHONE jack on the Model 250 front panel; then advance the knob CCW to obtain a comfortable listening level.

*NOTE: Assuming that the AUX INPUT jacks are not being used during this operation, it is a good idea to set RCV 1-2 at minimum (# 0) to eliminate any hiss from the unused inputs.*

12. There is another method to HEADPHONE monitoring for obtaining the most pleasing sound by passing the playback signal through the equalizer.

The INPUT selector of channel 4 is set to TAPE position. The INPUT fader is set at nominal position, PAN pot at center, the 4 CHAN BUSS at 3-4 position (not at 1-2 position as it will oscillate), the MASTER 1-2 fader at nominal position, and the HEADPHONE control is gradually advanced CW from its OFF position until the 4 CHAN BUSS signal is heard at a comfortable level.

13. Press the RESET button to zero the index counter so that after the recording, the ZERO RETURN button can be used to automatically rewind to this point on the tape.

14. Check the PITCH CONTROL to make sure it is centered so that tape records at normal 3-3/4 ips speed (9.5 cm/s). *NOTE: Recording can be done at faster or slower speeds for certain special effects; but for "normal" recording PITCH should be centered.*

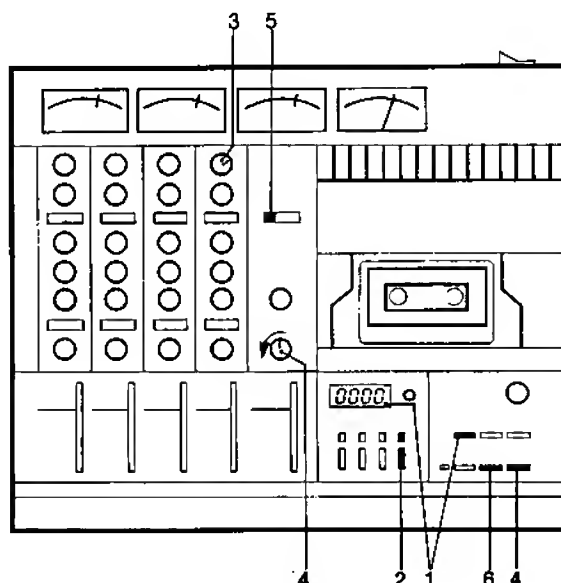
15. When ready to begin recording, simultaneously depress the RECORD and PLAY buttons. Confirm that tape is winding at constant speed onto the right hub. The LED above the # 4 RECORD TRACK button now should stay on instead of blinking, and the record mode LED adjacent to the RECORD button should also turn on.

*NOTE: Check the VU METER and peak LED occasionally to ensure they are in the proper range. If level adjustments are necessary while recording, USE THE INPUT FADER, NOT THE TRIM control.*

16. When the recording is completed, press the STOP button (which cancels recording and stops the tape).

## PLAYING BACK THE INITIAL TRACK JUST RECORDED

Figure 3. Steps for playback of the initial track.



1. Press ZERO RETURN. Assuming the index counter was zeroed before the recording was done, the tape will rewind to the beginning of the take (index 0000). Otherwise, press REWIND and then STOP when the index counter displays the appropriate reference number or when the end of the reel is reached.

2. Disengage the #4 RECORD TRACK button so that the track is in "safe" mode and cannot be accidentally erased.
3. Set input channel #4's MONMIX knob at scale #7 so that playback can be applied to the MONMIX output. (It is not necessary to move the 4 CHANNEL BUSS PAN pot.) The HEADPHONE control is set at the same position used for initial track recording.

*NOTE: There is an alternate approach to headphone monitoring where the INPUT selector is set to TAPE position. This allows use of channel EQ and track-to-track balance (via FADERS), but the added complexity is unwarranted during this reference playback.*

4. Reduce the HEADPHONE level setting as a precaution. Then press the PLAY button to commence playback and readjust HEADPHONE level as required.
5. To check the recorded level, leave the METER switch in RECORDER position, and observe the active VU METER (#4 in this example). It should indicate about the same level as shown prior to recording, that is, peaks of -3 to

0 VU. (A large discrepancy in playback level suggests that the tape is not of the proper oxide formulation, or that the record/play electronics require alignment.)





6. When the playback is completed, press the STOP button. *NOTE: If you are satisfied with the first take, you can continue the recording process by following the steps for sync recording (overdubbing) in Section 4.*

*If you prefer to erase and re-record the first take, proceed as follows:*














- a) Press ZERO RETURN to rewind to the beginning of the take.
- b) Press the #4 RECORD TRACK SELECT button to ready track 4 for recording.
- c) Press RECORD and PLAY simultaneously, and record the take again. The first take will automatically be erased as the new one proceeds.

*SUGGESTION: Multi-track recording and remixing can become more complicated than necessary. A simple system of noting the signals which are recorded on each track, and some basic control settings, will simplify future operations. An informal note pad, or a system of "log sheets" may be kept. A sample log sheet (track sheet) is shown in Figure 4, along with a blank form (Fig. 19) for you to reproduce in quantity for your own use.*

Figure 4. Recording sample log form.

TAPE No.: <b>3</b>		SONG/TITLE: <b>LOTS TO LEARN</b>		START DATE: <b>2/25/81</b>		END DATE: <b>3/2/81</b>		NOTE ALL PERFORMERS ON BACK OF THIS SHEET
INITIAL TAKE & OVERDUBS								
REF. NO.	TAPE INDEX COUNT	PROGRAM ON EACH TRACK OF TAPE				COMMENTS/NOTES		
		TRACK 1	TRACK 2	TRACK 3	TRACK 4			
		 RECORD TRACK	 RECORD TRACK	 RECORD TRACK	 RECORD TRACK	RECORD TRACK SELECTOR SETTINGS FOR INITIAL TRACK ASSIGNMENT.		
<b>1</b>	<b>000-208</b>		<b>RHYTHM GUITAR</b>	<b>LEAD VOCAL</b>	<b>DRUMS</b>	<b>2 TOMS, HAT, KICK, SNARE ON 3 TRACK.</b>		
<b>3</b>	<b>"</b>	<b>RHYTHM GUITAR + DRUMS</b>	<b>LEAD GUITAR</b>	<b>(LEAD VOCAL)</b>	<b>(DRUMS)</b>	<b>EQ - BOOST 4K &amp; CUT 300 ON GUITAR</b>		
<b>5</b>	<b>"</b>	<b>(RHYTHM GUITAR + DRUMS)</b>	<b>PERCUSSION (BLOCKS, TAMB., ETC.)</b>	<b>VOCAL HARMONY</b>	<b>LEAD GUIT + LEAD VOC.</b>	<b>PATCH DIR. OUT CUT TO DIS. DELAY LINES TO REC IN. TRACK 3 FOR VXL CHORUS</b>		

TRANSFERS/TRACK COMBINATION						
REF. No.	INDEX COUNT	PROGRAM TRANSFERRED ONTO EACH TRACK OF TAPE				COMMENTS/NOTES
		TRACK 1	TRACK 2	TRACK 3	TRACK 4	
<b>2</b>	<b>000-208</b>	<b>RHYTHM GUITAR AND DRUMS</b>	<b>(CAN BE ERASED)</b>	<b>(LEAD VOCAL)</b>	<b>(CAN BE ERASED)</b>	<b>MIX RHYTHM GUITAR &amp; DRUMS TO OPEN UP A TRACK (4+2 → 1)</b>
<b>4</b>	<b>"</b>	<b>( " )</b>	<b>(CAN BE ERASED)</b>	<b>(CAN BE ERASED)</b>	<b>LEAD GUIT &amp; LEAD VOC.</b>	<b>MIX LEAD GUIT &amp; LEAD VOCAL TO OPEN TRACK 2+3 → 4</b>

SETUP FOR REMIX TO STEREO (OR MONO)							
TRACK No.	CHAN. FADER	EQUAL 300 4K		2 CHAN (1-2) PAN	EFFECTS PATCH AUX OUT-? -AUX	AUX RCY	COMMENTS
<b>1</b>	<b>#6½</b>				<b>LEFT TO REVERB - RETURN REVERB TO L&amp;R</b>	<b>MAX SETTING - CUT TO 0' DURING</b>	<b>Fade 2 chm. Master as song ends.</b>
<b>2</b>	<b>#6½</b>				<b>RIGHT NOT USED</b>		<b>Ride gain on</b>
<b>3</b>	<b>#7½</b>					<b>DRUM SOLO</b>	<b>Track # 3 to Quad Cough at</b>
<b>4</b>	<b>A B</b>						<b>index # 135.</b>

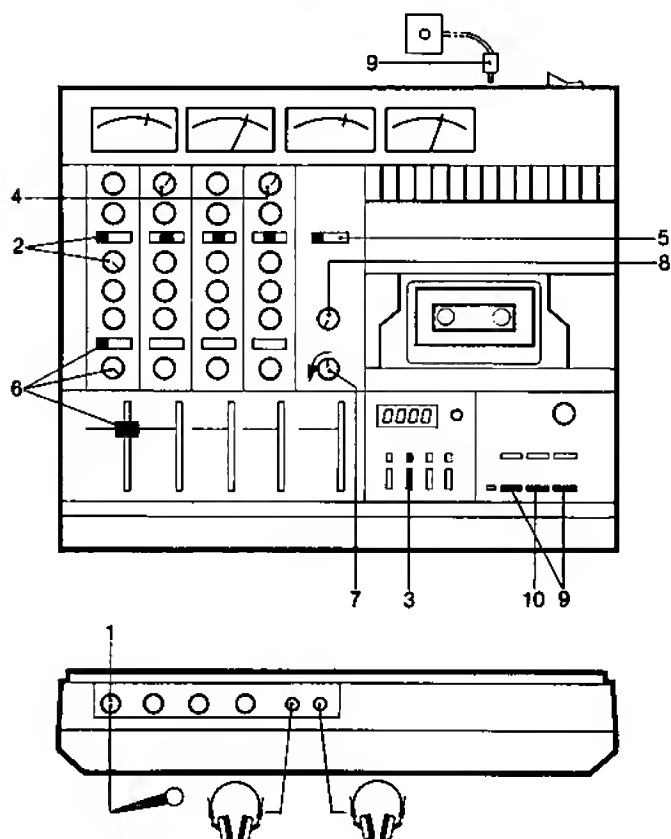
## SECTION 4 SYNC RECORDING (OVERDUBBING)

Sync recording, also known as overdubbing, is one of the major benefits of multi-track recording. It permits complex musical arrangements to be assembled one element at a time, sometimes by a single performer. The performer listens via headphones to previously recorded tracks while recording one or more additional tracks on the same tape. The Model 250 has special capabilities that enable it to playback and record synchronously (sync recording).

Recording in sync (making an overdub) is a natural extension of the process used to record the original track. The unit must be set for sync playback. If the performer is other than the person operating the Model 250, then a second set of headphones should be worn by the performer.

### MAKING THE OVERDUB

Figure 5. Steps for sync recording with Model 250.



1. Connect a mic or instrument to an input channel. Since a mic already is connected to channel 1 from the instructions in Section 3, it can be used. However, it will be assigned to record on a different track.
2. Choose the track on which the overdub is to be made. In this case, an overdub will be made on track #2, and set the input channel's 4 CHAN BUSS selector and PAN pot accordingly.
  - a) 4 CHAN BUSS selector at 1-2 position.
  - b) PAN pot fully clockwise at R position.
  - c) Set the 4 CHAN BUSS selector of inputs not being used (#2, #3, & #4) to OFF (center) position.

3. Depress the RECORD TRACK button corresponding to the track on which the overdub will be made (#2 in this case) to make the track ready for recording.

**CAUTION:** Make sure no other RECORD TRACK button is depressed since this could lead to inadvertent erasure of a previously recorded track.

4. Identify the channel numbers corresponding to those tracks which either are about to be recorded, or which have already been recorded (channels #2 and #4 in this example). Then:
  - a) Set INPUT channel #2's MONMIX to scale #7. This ensures that the track 4 playback and track 2 recording signals will be fed to the MONMIX buss.
5. The METER function switch should be set to RECORDER position so the recording level and track 4 playback level can be monitored by the HEADPHONE outputs.
6. On the channel with the live sound source (channel #1):
  - a) Set the INPUT selector switch at LINE/MIC position.
  - b) Set the channel FADER at nominal #7 to #8.
  - c) Adjust the TRIM control for a suitable level indication on the TRACK 2 VU METER (peaks approx. -3 VU to 0 VU).
7. Set the HEADPHONE control for the desired listening level.
 

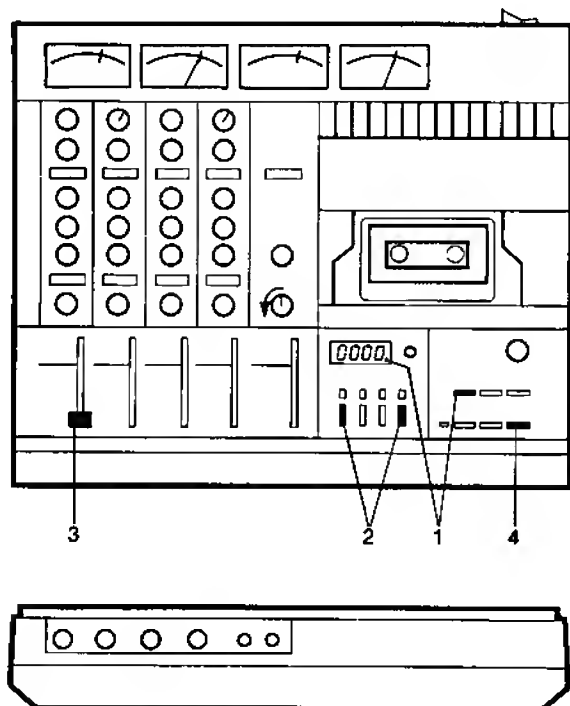
*NOTE: The sound heard in the headphones does not necessarily reflect the level balance that will exist in the final mix. Initially, the tracks are each being recorded at the optimum level for high signal-to-noise ratio and low distortion. During remix they can be precisely level balanced.*
8. Assuming that the AUX INPUT jacks are not being used during this operation, it is a good idea to set RCV 1-2 at minimum (#0) to eliminate any hiss from the unused inputs. Also, check the PITCH CONTROL to make sure it is centered so that tape records at normal 3-3/4 ips speed (9.5 cm/s).
9. When ready to begin recording, simultaneously depress the PLAY and RECORD buttons. Confirm that tape is winding at constant speed onto the right hub. The LED above the #2 RECORD TRACK selector button now should stay on instead of blinking, and the record mode LED adjacent to the RECORD button also should turn on.
 

*NOTE: If the operator requires both hands free, use the remote foot switch. Place the transport in play mode, then step on the switch at the instant you wish to initiate recording.*
10. When the recording is completed, press the STOP button.



## PLAYING BACK THE ORIGINAL TRACK AND THE OVERDUB

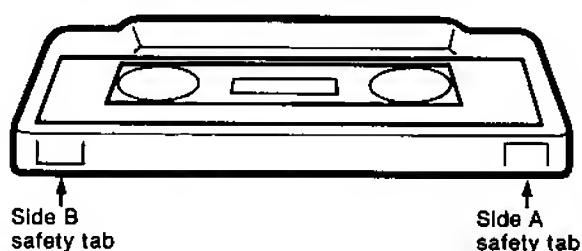
Figure 6. Steps for playing back the initial and overdubbed tracks.



You may wish to combine two or three previously recorded tracks on to another track, which "opens up" tracks for additional overdubbing. This process is known as combining tracks (or a "ping-pong"), and is described in Section 6.

**SUGGESTION:** When the recording and overdubbing process is completed, and no further recording is contemplated, it is a good idea to protect the cassette against any inadvertent erasure. Do so by punching out *BOTH* safety tabs on the rear edge of the cassette. Do not assume one safety tab will offer protection. Since the Model 250 records all four tracks on one side of the cassette, with only one safety tab removed it would be possible to insert the cassette upside down and inadvertently record over your valuable program.

Figure 7. Punching out the record-safe tabs to prevent erasure of or recording over an existing program.



1. Press ZERO RETURN to rewind the tape to the beginning of the take.
2. Release all RECORD TRACK buttons (# 2 in this example) to prevent inadvertent erasure by placing the tracks in safe mode.
3. Bring down the input FADER on the channel used for the overdub mic (or instrument). While not mandatory, this step avoids distraction from live inputs before or after playback (the input is "dead" during actual playback).
4. Press the PLAY button. (If necessary, adjust HEADPHONE level).

## TO OVERDUB ADDITIONAL TRACKS

Repeat the preceding overdub steps. Input channel # 1 may continue to be the "live" channel; assign it to tracks # 1 and # 3 by switching the 4 CHAN BUSS selector and adjusting the PAN pot below that selector. Also, press the # 1 or # 3 RECORD TRACK button to make the appropriate track ready for recording. When setting level with the TRIM control, observe the VU METER corresponding to the track on which the live program is being overdubbed. VU METERS for the other tracks (tracks 2 and 4) will be inactive until the unit is placed in record mode, at which time they display the previously recorded signal levels.

## SECTION 5 MIXDOWN (REMIXING)

During the initial recording and overdubbing stages, tracks are recorded at near maximum levels. Also, it is probable that each sound source has been recorded on only one track (not panned between tracks). The final stage in creating a stereo program requires that track-to-track levels be balanced, and that each track be panned somewhere from left-to-right in the stereo perspective. Some touch-up equalization may also be done at this time. The final process is known as mixdown (or remixing).

In previous steps, you monitored the program using headphones, and the Model 250 MONMIX buss signal came directly from the reproduce amplifiers. Monitoring is more critical during the mixdown, and hence loudspeakers are preferable to headphones (although phones can be used). Any good stereo, high fidelity sound system will do the job. Simply connect a pair of cables from the Model 250 LINE OUT 1 and 2 jacks to the auxiliary or line inputs on the stereo integrated amplifier or receiver (or to the power amp inputs) by a set of "Y" cables. As a precaution, turn off the stereo amplifier, and set its volume at minimum, before connection to the Model 250.

Connect the LINE OUT 1 and 2 jacks of whatever stereo tape recorder you wish to use for making the stereo master tape to the other side of the "Y" cable (conventional cassette or reel-to-reel).

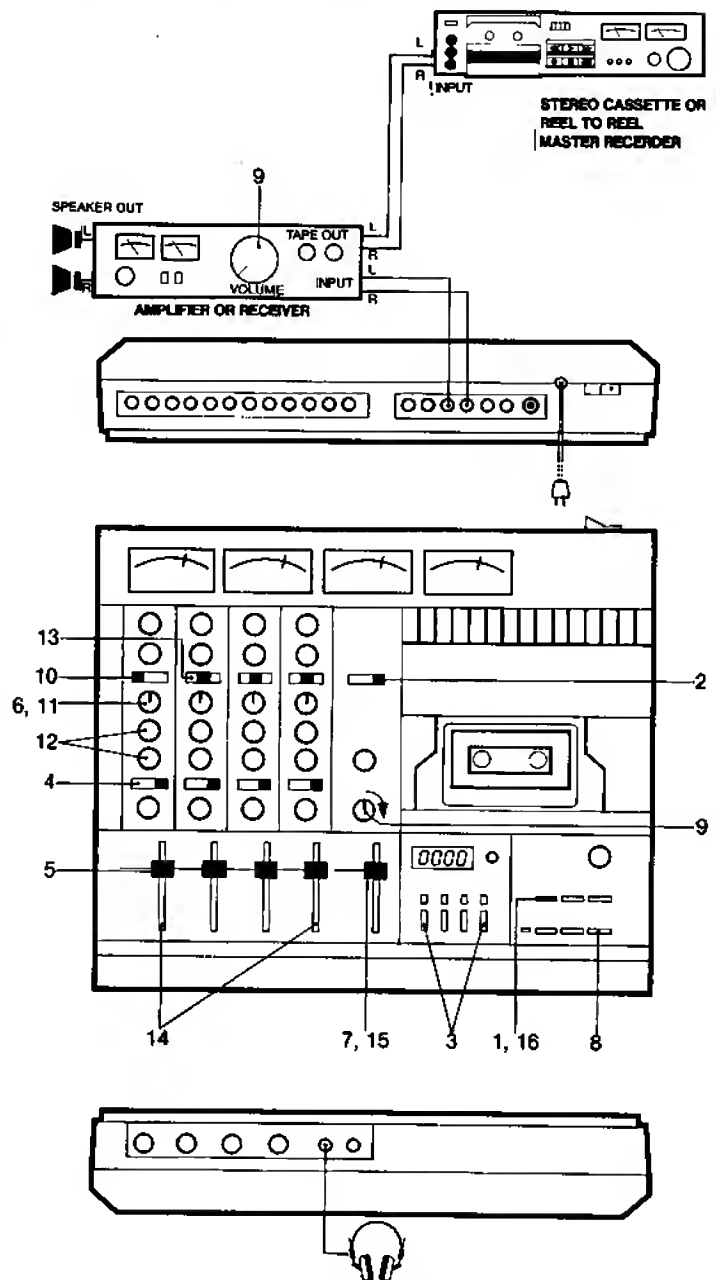
**NOTE:** An alternative connection involves connecting the Model 250 LINE OUT to the preamp, integrated amp/preamp or receiver, and then connecting the tape output jacks from that unit to the stereo recorder. This may be an easier approach if your sound system is already connected to a stereo recorder. The drawback is that the output from the Model 250 must go through additional electronics before it is re-recorded, and thus may be degraded unnecessarily.

The MASTER 1-2 FADER controls the level at both the LINE OUT 1, 2 jacks, so level changes affecting the recording will be heard in the monitor speakers. This FADER should be set to obtain the optimum recording; monitor levels can be trimmed using the volume control on your preamp, amplifier, integrated amp/preamp or receiver.

You may wish to do several "trial runs", refining the mix prior to making the transfer to the stereo recorder.

### SET UP AND PROCEDURE FOR MIXDOWN

Figure 8. Equipment set up & steps 1-16 of mixdown procedure (see Fig. 9 for remaining steps).



**NOTE:** To begin, the monitor amplifier should be connected, its power turned on, and its volume set very low (near minimum). The stereo master tape recorder should also be connected and ready.

1. Rewind the cassette (press ZERO RETURN or REWIND & STOP).
2. Set the METER function switch to MIXER position.
3. Make sure all RECORD TRACK buttons are released (in "record safe" position) to preclude accidental erasure of the multi-track master cassette.

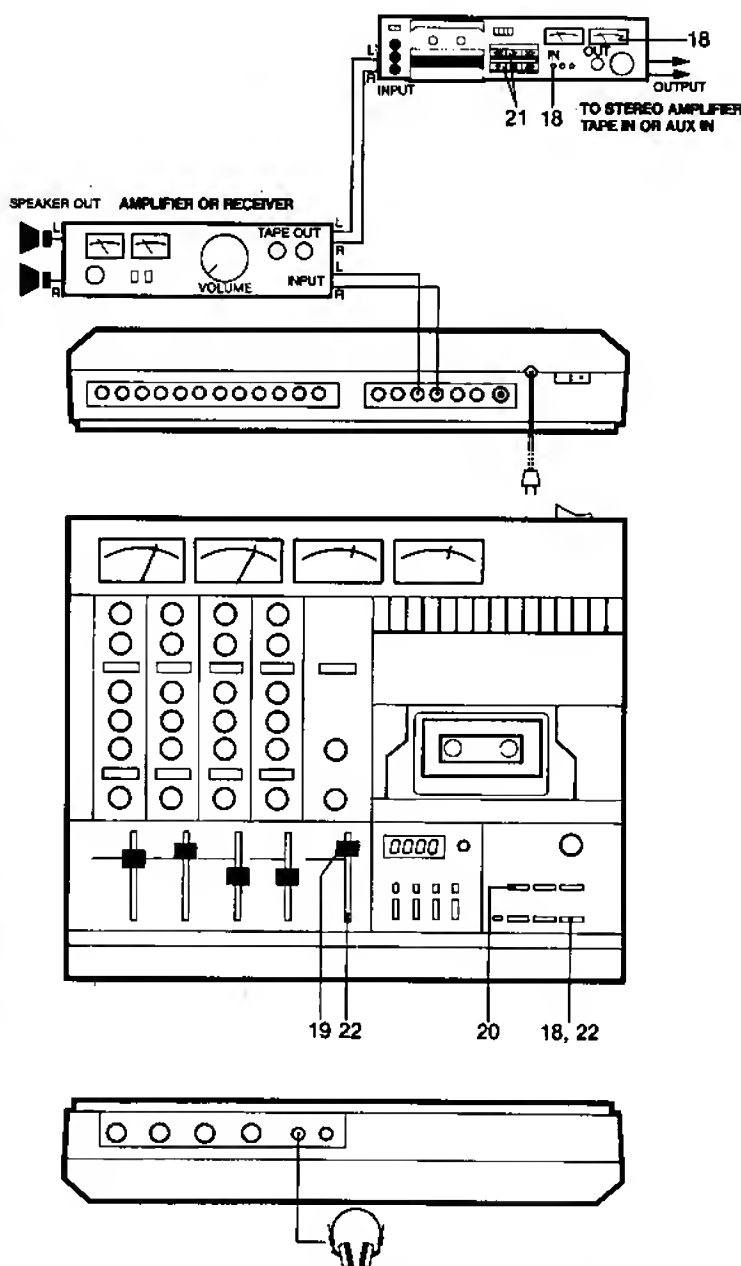
4. Set all INPUT selector switches to TAPE position.
5. Initially, set all input FADERS at nominal (#7 to #8).  
*NOTE: The TRIM controls have no effect when the unit is operated in this configuration.*
6. Initially, set all 4 CHAN BUSS PAN pots at center.
7. Set the MASTER 1-2 FADER at nominal (#7 to #8).
8. Press the PLAY button, causing tape to roll.
9. Gradually bring up the monitor amplifier volume until the desired level is heard. (Alternately, if listening with headphones, adjust the HEADPHONE volume control CW from OFF position).

*NOTE: Both channels will have the same program (mono), and relative balance probably will be incorrect at this point.*

10. Set the 4 CHAN BUSS selector to 1-2 of channel 1 and those of other channels 2 through 4 to OFF position and the channel 1 fader to nominal position.
11. Adjust the 4 CHAN BUSS PAN pot on channel 1 to place the program from track 1 anywhere from left to right in the stereo perspective.
12. Adjust the channel 1 EQ controls as desired to:
  - a) obtain the most pleasing sound quality,
  - b) reduce leakage of unwanted sound in the channel, or
  - c) improve separation from other channels by accenting or minimizing parts of the frequency spectrum.
13. Set the 4 CHAN BUSS selector of channel 1 to OFF position and that of channel 2 to 1-2 and bring up the fader of channel 2. Repeat steps 11 and 12 for channel 2, and for each of the remaining channels, thus creating a stereo panorama of the various acoustic images.
14. Bring up all four channel input FADERS to nominal setting; then move them down (or up) as required to balance the level between tracks. Observe the VU METERS to ensure that the level peaks between -3 VU and 0 VU in both the 1 (track 1) and 2 (track 2) meters; the red peak indicator LEDs should flash only once in a while.  
*NOTE: The 3 and 4 meters will be inactive in this mode; only the 2 channels are being monitored.*
15. If necessary, adjust the MASTER 1-2 FADER to obtain the correct VU indications, with these exceptions:
  - a) If the MASTER FADER must be set below #6, instead reset it at #7 and lower all four input FADERS sufficiently to obtain the optimum level.
  - b) If the MASTER FADER must be set between #9 and #10, instead reset it at #8 and raise all four input FADERS sufficiently to obtain the optimum level.*NOTE: If the speakers are too loud or too quiet, adjust the monitor amplifier volume (or if phones are used, adjust HEADPHONE volume).*
16. Rewind the tape (press ZERO RETURN or REWIND then STOP). If desired, press PLAY, and recheck the balance and sound quality. When ready, rewind again and proceed.

## COMPLETION OF THE MIXDOWN: RECORDING THE STEREO MASTER

Figure 9. Steps 17 through 23 of mixdown process.



17. Place the stereo master recorder in record ready mode. (Press record/pause, or whatever mode permits the record levels to be adjusted without rolling tape.)  
*NOTE: Steps 17, 18 and 19 enable the proper record level to be set. The Model 250 controls are adjusted so the 1 & 2 VU METERS indicate a suitable output level, and the monitor speakers or phones level may appear to be correct, yet none of this ensures proper recording levels; these are set on the stereo master recorder.*

18. Press the Model 250 PLAY button, and observe the record level meters on the stereo master recorder. If necessary, adjust the record level on that unit so the levels fall within the manufacturer's specified optimum range.
19. Check the sound quality at the stereo master recorder by plugging in a set of headphones to that unit's phones jack (if it has none, skip this step). In rare cases, a level mismatch may cause excess noise or distortion; usually this can be remedied as follows:
  - a) If the sound is very distorted, the Model 250 output level is probably too high; lower the MASTER 1-2 FADER, and raise the record level control on the stereo master recorder.
  - b) If the sound is very noisy or hissy, the Model 250 output level is probably too low; raise the MASTER 1-2 FADER, and, if necessary, lower the record level control on the stereo master recorder.

20. Press ZERO RETURN to rewind the Model 250 multi-track master cassette to the beginning of the program.
21. Place the stereo master recorder in record mode.
22. Press the Model 250 PLAY button. The mixdown is now being accomplished; the result will be a stereo master tape.

*NOTE: If you plan to fade out at the end of the program, it is best to do this with the record level controls on the MASTER 1-2 FADER, rather than with the stereo master recorder.*

23. To monitor the stereo master tape, use headphones or connect the line or play output of that recorder to the monitor amp. If using a stereo preamp, integrated amp or receiver, there is probably a separate input that can be used without having to disconnect the Model 250 from the amp (but be sure to switch the amp's input selector).

## SECTION 6 COMBINING TRACKS (PING-PONG)

Track combination involves moving program material from one or more tracks to another track (transfer and combination) in order to "make room" for additional program material. During the track combination (also known as "ping-pong"), additional live sounds can be added.

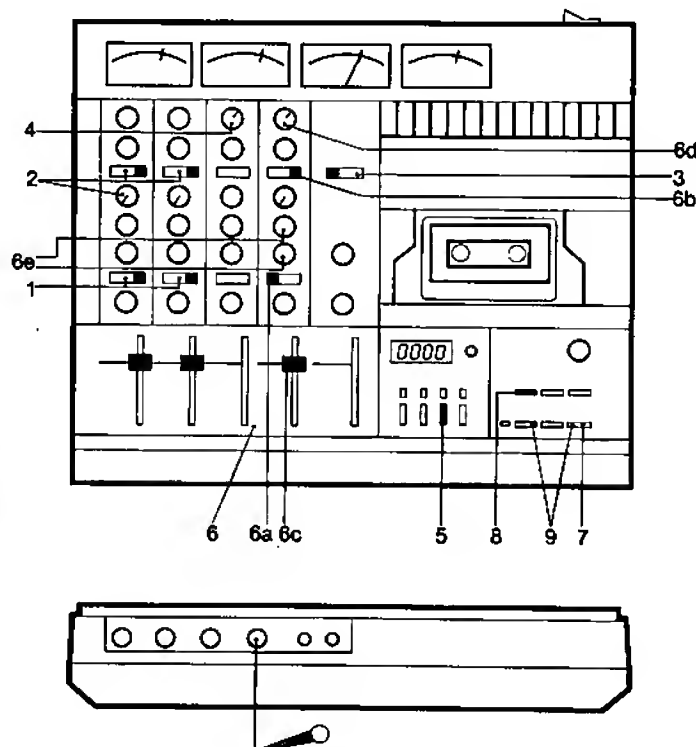
*NOTE: There are practical limits as to how many times a track can be transferred since some background noise is inevitably added during the process; we recommend no more than two rounds of ping-pong for a given original track.*

### HOW TO COMBINE TWO TRACKS INTO ONE

*NOTE: The following steps are expressed in general form. However, for clarity, we will use an example where program is being transferred from tracks 1 and 2 onto track 3, citing this example parenthetically.*

1. Set the INPUT selector switches to TAPE on the channels numbered to correspond with the tracks from which the transfer will be made. (e.g., when program is being transferred from tracks 1 and 2 to track 3, set the channel 1 and 2 switches to TAPE position).
2. On the same channels you just switched to TAPE mode, set the 4 CHAN BUSS selector switches and PAN pots so that signal is assigned to the track onto which the transfer will be made. All other 4 CHAN BUSS selectors should be in the center OFF position. e.g., since the transfer is made onto track 3, the channel 1 and 2, 4 CHAN BUSS switches should be in 3-4 position, and their PAN pots should be fully CCW (to L).
3. Set the METER switch to RECORDER position so you can monitor the level being applied to the track on which

Figure 10. Steps for combining two tracks to one.



recording will be made. The meters also will deflect on those tracks from which program is being derived, but since this is ahead of the INPUT FADERS, such meter indications are not particularly useful.

4. Set MONMIX #3 to scale 7 and HEADPHONE control to MONMIX position. This enables you to monitor the active record buss, and avoids confusion from other signals (no other record buss is being used).
5. Depress the RECORD TRACK button for the track onto which the transfer will be made so it is ready for recording (track #3 in the example).
6. If you are simultaneously adding one or two live sources during the transfer, use either of the channels whose number does not correspond to the tracks from which existing program is being derived. (In the example, since the program is taken from tracks 1 and 2, use channel 3 and/or 4 for live inputs). To add a live vocal overdub via input channel 4, for example:
  - a) Set the channel 4 INPUT selector switch to LINE/MIC.
  - b) Set the channel 4 CHAN BUSS selector switch to 3-4 position, and the PAN Pot fully CCW to assign the mic to track 3.
  - c) Set the channel 4 input FADER one index higher than nominal (#8-#9), and with sound present at the mic (or while playing the instrument), adjust the channel 4 TRIM control for a normal indication on the #3 VU meter (e.g., peaks -3 to 0). (Later, the FADER will be set at nominal, reducing the contribution of a given channel to allow for the additional signal from the transferred track).
  - d) Set MONMIX, at top of channel 4, to scale 7.
  - e) Make any desired EQ adjustments on channel 4.

*NOTE: If two live sources are being added, follow steps (a) through (e) above using the remaining "free" input, channel 3 in this case. The only "trick" involved in using the same channel for a live input and to assign the record track is the headphone monitoring; set channel #3's MONMIX to scale 7 when first adjusting the live source so you can listen to the input to the recorder and thus monitor the previously recorded program and the live sources.*

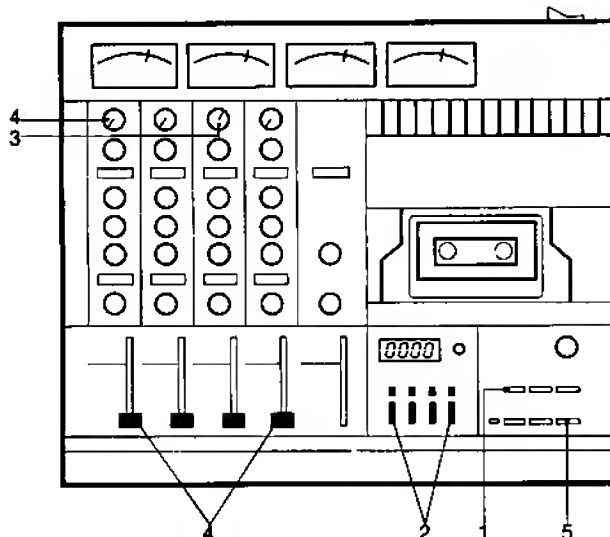
7. Press the PLAY button, and adjust the input FADERS on those tracks being combined. Balance this sound with any live inputs, too.

*NOTE: The VU meter corresponding to the track on which the recording is being made (track 3) should show normal levels, peaking at -3 to 0 VU. If not, retain the relative balance by adjusting the INPUT FADERS on all channels contributing to the recording (pre-recorded and live). Remember that the MONMIX control has no effect here, and the HEADPHONE control affects only the listening volume, not the recording level.*

8. The system is now ready for the actual recording. Press ZERO RETURN (or REWIND then STOP) to get back to the beginning of the program.
9. Simultaneously press PLAY and RECORD, and the tracks are combined onto one. (For greater convenience when adding a new input, press PLAY and use the REMOTE PUNCH IN foot switch to initiate recording; be sure to begin recording before the original tracks start.)

## TO PLAY BACK AND EVALUATE THE TRACK COMBINATION

Figure 11. Steps to evaluate a combination (ping-pong).



1. Rewind the tape.
2. Release the RECORD TRACK button for safety.
3. Set the appropriate MONMIX to scale 7 position (MONMIX 3 in this case).
4. Set all other MONMIX to full CCW and bring down all input FADERS to avoid confusion from the other tracks.
5. Press the PLAY button.
6. If you prefer to make changes, simply repeat steps 1 through 9 of the previous procedure. Once satisfied, you are free to record new program on the original tracks which are no longer needed (e.g., tracks 1 and 2 in this example).



## SECTION 7 STEREO RECORDING

Stereo recordings involve 2 channels of information that are integrally related; when monitored with a pair of stereo headphones or a stereo speaker system, such recordings create an acoustic image known as the "stereo panorama" or "stereo perspective".

There are two general methods to creating a stereo recording. A "purist" stereo recording method places a pair of microphones in the midst of a performance, assigning each mic to its own track, and then recording the program essentially in one take (Fig. 12). A second approach to stereo recording utilizes several microphones, locating each mic close to an individual sound source, and panning each to a location in the stereo perspective when recording the two tracks (Fig. 13). In this case, the recorded perspective may or may not be true to actual sound source locations.

With either method of stereo recording, 2-mic "purist" or panned multiple mics, the recording can be completed in one

take, or it may be augmented in subsequent overdubs. To overdub, the original pair of stereo tracks are transferred 1:1 to a second pair of tracks, and at the same time are mixed with any new sound sources (stereo mic or otherwise).

The term "stereo" often has been used imprecisely to describe 2-track (or 2-channel) recordings. In 2 track recordings, a pair of tracks contain related sounds (whether recorded at the same time, or via an overdub), but each track has a discrete sound source so that playback does not create a coherent stereo panorama. In this instance, remixing (and panning each track somewhere from left-to-right) will be required to obtain a stereo image.

In practice, the distinction between stereo and 2-track recording is primarily a matter of mic placement and pan pot position. For this reason, both techniques are discussed together in this section of the manual.

Figure 12. Stereo recording using 2 microphones, one assigned to a "left" track (track 1) and one to a "right" track (track 2), to capture the stereo panorama: a purist" approach. A typical Model 250 setup for this recording is shown.

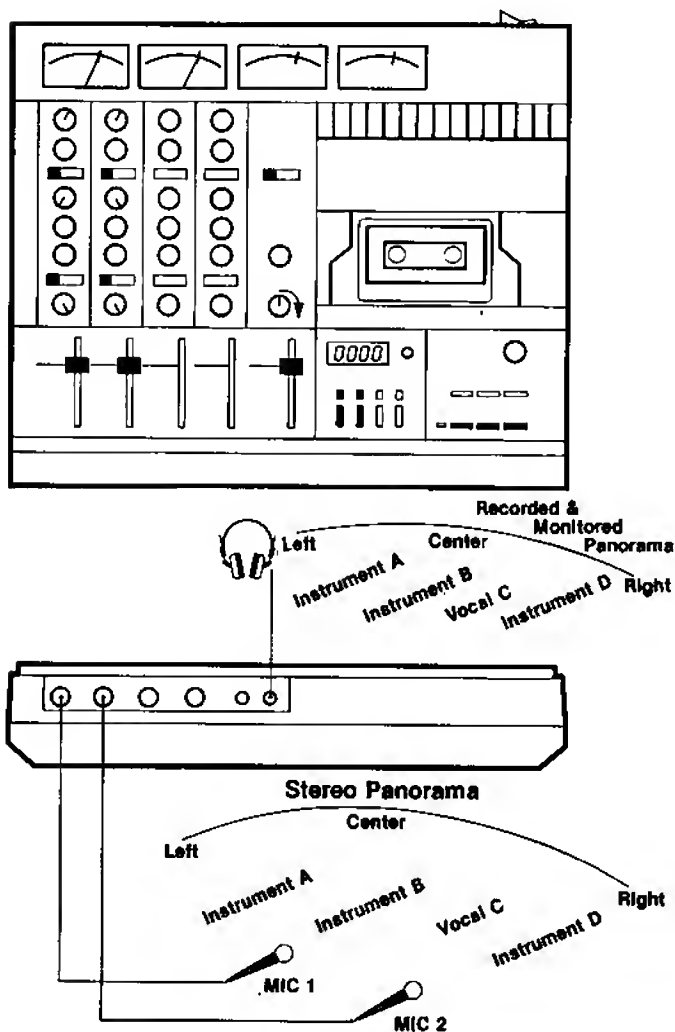
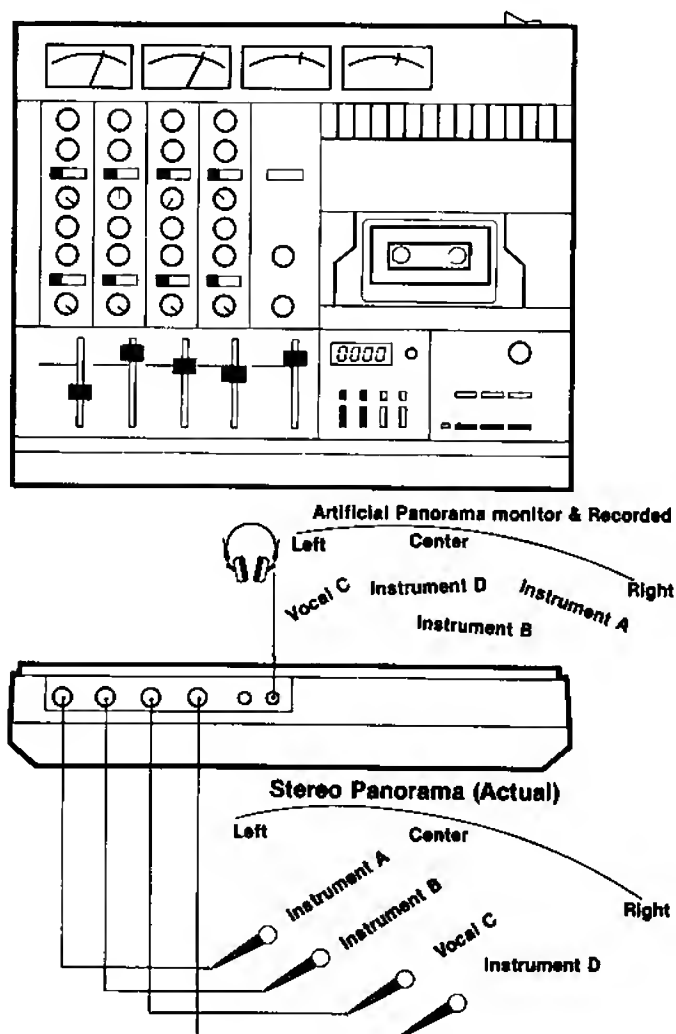


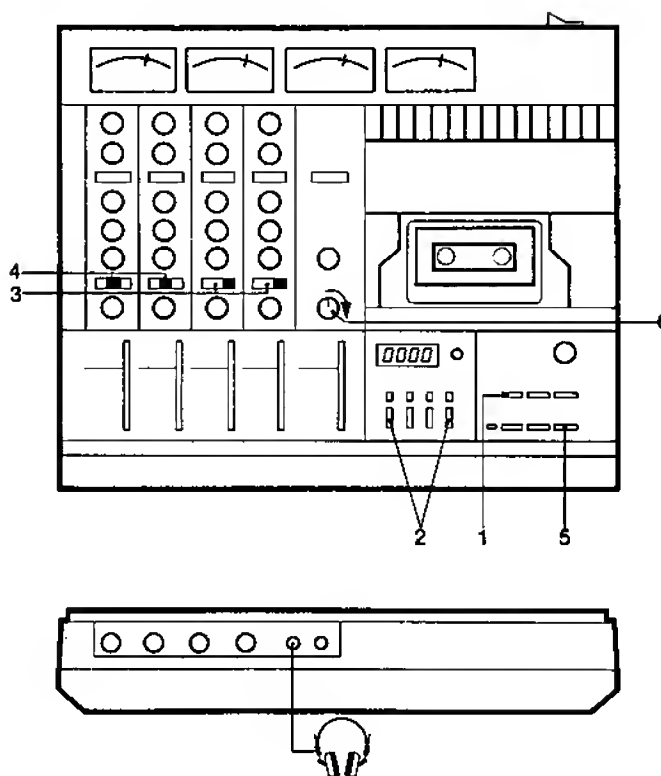
Figure 13. Stereo recording using multiple microphones, each panned at some location between the "left" and "right" tracks (1 and 2), to emulate or artificially create a stereo panorama. A typical Model 250 setup for this recording is shown.



to R. If close mic or direct instrument inputs are used, these can be panned to any position in the stereo perspective, but during the initial setup, pan fully to one track.

7. Initially set all input FADERS all the way down (#0). Then, one channel at a time, perform the following steps:
  - a) On the channels with new signals, raise the FADER to nominal (#7-#8). Then, with signal present at the input, adjust the TRIM control for a VU METER indication of approximately -3 to 0 VU.
  - b) On these same channels, adjust the EQ as desired, then set the 4 CHAN BUSS to OFF position.
8. Press the PLAY button to begin playback of the existing tracks to balance these levels with the new inputs.
  - a) If the channel 1 & 2 INPUT selectors are in TAPE position (i.e., only 1 or 2 new inputs is being added), raise the #1 & #2 INPUT FADERS to nominal position and check the VU METER levels. Playback from track 1 will be monitored on the TRK 3 meter, and can be adjusted with the channel 1 input FADER. Playback from track 2 is seen on the TRK 4 meter, and adjusted with the channel 2 input FADER. (The channel 1 & 2 trim controls have no effect here).
  - b) Bring up the input FADERS on the channels with new signals, and balance these with the previously recorded tracks.
  - c) If 3 or more new inputs are being added, and the TAPE OUT 1 & 2 jacks are patched directly to RECORD IN 3 & 4, then there is no way to adjust the transfer level; instead adjust the input FADERS for the new signals to achieve the desired balance with the tracks being transferred.
9. Rewind the tape by pressing ZERO RETURN.
10. Depress the RECORD TRACK #3 & #4 buttons to make these tracks ready for recording.
11. When ready to record, press the PLAY and RECORD buttons. (Alternatively, press PLAY and use the REMOTE PUNCH IN FOOT SWITCH to initiate recording; be sure to begin recording before the original tracks start.)

Figure 17. Steps to evaluate a stereo transfer.



*NOTE: If a jumper cable was connected from TAPE OUT to REC IN, and the transfer/overdub is completed, disconnect that jumper cable.*

## TO PLAYBACK AND EVALUATE THE STEREO TRANSFER

1. Press ZERO RETURN to rewind the tape.
2. Release the RECORD TRACK buttons for safety.
3. Set the appropriate INPUT selectors to TAPE position (channels 3 and 4 in this case).
4. Set the other INPUT selectors (channels 1 & 2) to OFF to avoid confusion from any previously recorded tracks or live inputs.
5. Press the PLAY button.
6. Adjust headphone level with the HEADPHONE control.
7. If you prefer to make changes, simply repeat steps 1 through 11 of the previous procedure. Once satisfied, you are free to record new program on the original tracks which are no longer needed (e.g., tracks 1 and 2 in this example).

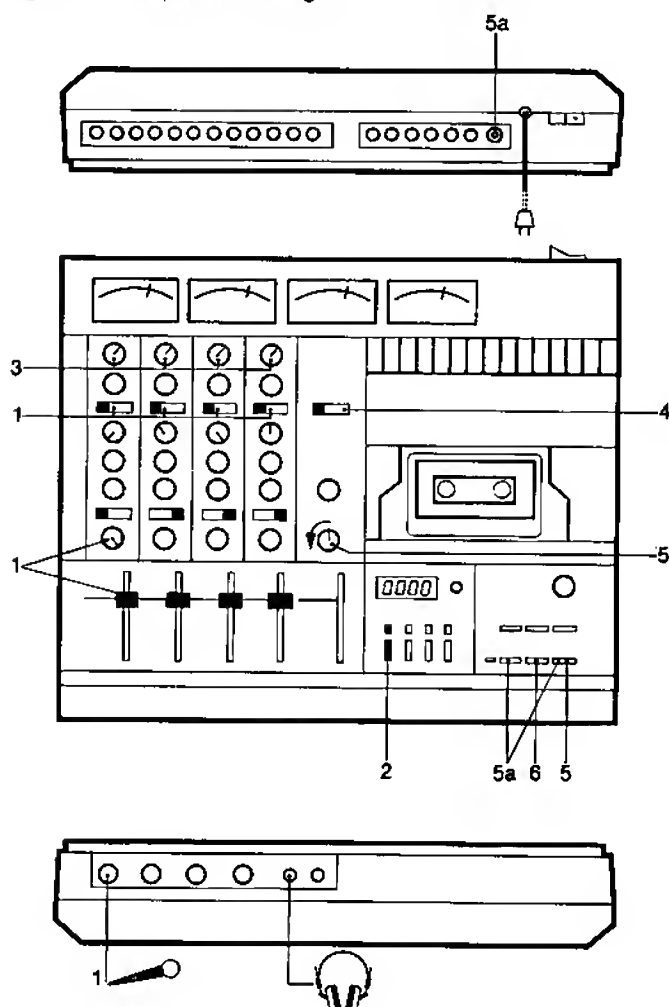
## SECTION 8 INSERTS (PUNCH-IN RECORDING)

Inserts are useful for replacing portions of an otherwise satisfactory recording (e.g., re-recording one stanza of a lead vocal track without affecting the others):

Inserts are essentially the same as an overdub; they are recordings of new material made in synchronization with one or more previously recorded tracks. The difference is that while an overdub is made on a different track, the insert (or punch-in) is made on the same track as previously recorded material. Thus, wherever the insert is located, previous material is erased. For this reason, one cannot "layer" new material on top of an existing track during the insert; combining tracks (or ping-pong) would be required to obtain this result; refer to Section 6.

When one is listening to the existing track(s), ready to begin the insert, it is obvious that precise timing is essential. If the person operating the Model 250 is also the performer, it might be difficult to press the RECORD and PLAY buttons, and to also be ready to perform. Fortunately, the Model 250 has a foot switch jack for remote punch-ins. One need simply place the unit in play mode, with the appropriate RECORD TRACK selector depressed, then step on the foot switch at the moment the insert must begin; a second actuation of the foot switch ends the insert, returning the unit to play mode.

Figure 18. Steps for making an insert.



1. Connect a mic or instrument to an input channel, and assign that channel so its signal goes to the track on which the insert will be made (use the 4 CHAN BUSS selector and PAN pot).
2. Depress the RECORD TRACK button for the track onto which the insert will be made.
3. Set all MONMIX to scale 7.
4. Set the METER function switch to RECORDER position.
5. Press PLAY, monitoring the existing track(s) in the headphones. At the moment you wish to begin the insert, either:
  - a) Press PLAY and RECORD simultaneously, or
  - b) Step on the REMOTE PUNCH-IN/PUNCH-OUT foot switch.

*NOTE: We recommend beginning an insert at a time when no signal is present on the track to be used (e.g., between notes or during a rest). If possible, also begin the insert in synchronization with a drum beat on another track. These procedures will help avoid or mask any audible click that might be created by the insert.*

*NOTE: An alternate method to begin the insert is to leave all RECORD TRACK button switches disengaged, and to initially press the PLAY and RECORD buttons. Then, to begin the insert, depress the appropriate RECORD TRACK button. . . The REMOTE FOOT SWITCH cannot be used to initiate the insert in this case.*

6. To end the insert, either:
  - a) Press the STOP button, or
  - b) Step on the REMOTE foot switch a second time.

## SECTION 9 INTERFACE DETAILS

This section of the manual is written for the non-engineer, who may have only a vague idea of the meaning of levels (whether expressed in dBV, volts or millivolts), and who probably understands even less about impedance (expressed in ohms or kilohms). The following subsections are written to impart a greater understanding of level and impedance, with specific regard to the Model 250.

### LEVELS AND DECIBELS (dB)

Level is a term loosely used to describe the amplitude of a signal or a sound. More precisely, "level" is the value of a sound or signal relative to a given reference and usually expressed in dB SPL (DeciBels, Sound Pressure Level) dBV (DeciBels, Volts). The relationship between dB and volts (or dynes, when discussing sound pressure) is not a 1:1 because the "dB" value expresses a ratio, one which is based on logarithms.

*NOTE: An understanding of the following few paragraphs can be very helpful, but is not necessary for connecting the Model 250 to other equipment. We have avoided formulas and highly technical language to the extent possible.*

If the voltage level is doubled, the number of dB is not doubled—it is increased by 6. This means that whether the voltage goes from 30 millivolts to 60 millivolts (a 30 mV increase), or from 5 volts to 10 volts (a 5 volt increase), the level increases by the same 6 dB. By the same rules, if the voltage goes up by a factor of 10, the level increases 20 dB. The same relationship applies to sound pressure level (doubling the number of dynes is an increase of 6 dB SPL).

dBV values can be converted to specific voltages, and vice-versa; a special slide rule or scientific calculator is usually employed. In simple terms, however, the key to the conversion is the "reference" value for dBV. The large "V" in dBV means that the 0 dB value is related to a specific Voltage, 1 volt in this instance. Given that 1 volt is 0 dBV, the following table can be readily constructed:

(plus dB over 1 volt)	(minus dB under 1 volt)
2 volts = +6 dBV	0.5 volts = 500 mV = -6 dBV
4 volts = +12 dBV	0.25 volts = 250 mV = -12 dBV
8 volts = +18 dBV	0.125 volts = 125 mV = -18 dBV
10 volts = +20 dBV	0.1 volts = 100 mV = -20 dBV

*NOTE: Some equipment is rated using a different 0 dB reference value. 0 dBV equals 0.775 volts, so a given voltage, rated in dBV will be 2.2 dB higher than the dBV operating. 0 dBm is referenced to 1 milliwatt (power, not voltage), but in a 600 ohm circuit, the dBm number is identical to the dBV number, so a conversion can be approximated by assuming 600 ohms. Bear these differences in mind when comparing specified levels in different equipment.*

### NOMINAL LEVELS

Except in the case of a test signal, such as the output of a tone oscillator or a continuous organ note, signal levels almost always vary up and down as the sound itself changes from very loud to very quiet. For this reason, the term

"nominal level" is used to describe the approximate operating level of a given circuit (expressed in dB or voltage). Remember that minimum levels (quietest passages) are below the nominal level, and maximum levels (loud passages) are above the nominal level.

With regard to the Model 250 and related equipment, there are several nominal levels involved, the most significant of which are (a) microphone level, (b) line level.

Nominal mic level = -60 dBV = 1 millivolt

Nominal line level = -10 dBV = 300 millivolts (0.3 volts)

### MODEL 250 INPUT LEVELS

When connecting mics to the Model 250 MIC/LINE INPUTS, remember that some microphones have higher output levels than others; a given mic will have a higher level when it is nearer to the sound source or when the sound is louder. Hence, a microphone's nominal level may be higher than -60 dBV, sometimes as high as -30 dBV. Instruments such as electric guitars and pianos, may have nominal levels higher than -60 dBV but perhaps lower than -10 dBV. Most consumer tape recorders, tuners stereo equipment, and so forth utilize line levels of approximately -20 dBV to -10 dBV. This is why the TRIM (LINE-MIC) control is provided; it allows the input sensitivity to be adjusted to suit the actual input source.

The Model 250 RECORD IN and AUX IN jacks are meant for connection to equipment having -10 dBV nominal output levels. Since the RCV 1-2 control can lower the AUX IN sensitivity, higher input levels can be accommodated.

Some sound equipment outputs are rated at +4 dBm nominal. This equals 1.23 volts, which in turn equals about 1.8 dBV, 12 dB above the Model 250's line input sensitivity. The Model 250 specifications show that the unit is rated for maximum input levels of +12 dBV (MIC/LINE and RECORD inputs), and +20 dBV (AUX IN). This might appear to accommodate a +4 dBm nominal signal, yet such a signal may have peaks of +18 dBm to +24 dBm (about +16 to +22 dBV). Thus, unless a +4 dBm nominal output is reduced in level, or attenuated with an external pad, the Model 250 input still may be overdriven on peaks, causing audible distortion.

### MODEL 250 OUTPUT LEVELS

All Model 250 outputs are rated at -10 dBV (0.3 volts) nominal level, with a maximum output of +15 dBV (5.6 volts). A signal that would tend to cause higher than +15 dBV output levels will merely create distortion (clipping). The VU METERS are helpful in avoiding distortion due to excess levels.

Since most consumer tape recorders, tuners, stereo equipment, and so forth utilize line levels of approximately -20 dBV to -10 dBV, the Model 250 outputs should be compatible. If an accessory has a rated input level of +4 dBm nominal, the Model 250 output may not be adequate to drive that accessory to full output level; this is not necessarily a problem, although some additional noise may be introduced. If the +4 dBm rated accessory has a gain (volume or level) control that can be increased, as many do, then it will operate normally when driven by the Model 250 output.

*NOTE: Many power amplifiers are rated at +4 dBm to +8 dBm (1.23 to 2 volts) input sensitivity. While it might not be apparent, such amplifiers can be driven to full power by the Model 250's -10 dBV outputs. Power amplifiers are an exception to the rule; the input sensitivity specification of a power amplifier is the level required to drive the amplifier to its maximum rated output power. To avoid clipping distortion on peaks, nominal input levels to the amp should be 10 dB to 20 dB below the rated amplifier sensitivity. Given that the Model 250 outputs are -10 dBV nominal, and allowing a 2 dB approximate correction for dBV to dBm conversion, the Model 250 output level is about 12 dB below +4 dBm—just right. At times, it may be desirable to lower the Model 250 output level (bring down the MASTER 1-2 FADER)—a surprise if one had casually compared the -10 dBV nominal output to the +4 dBm amplifier input sensitivity.*

### IMPEDANCE IN GENERAL

Impedance (abbreviated "Z") can be defined as the total opposition to the flow of alternating current in an electrical circuit. In this context, alternating current (ac) refers to an audio signal, not to the power mains. Impedance and resistance are similar, both being expressed in ohms.\* However, resistance ("R") is the opposition to dc current flow, not ac; "Z" and "R" seldom are equal in a given circuit; in fact, impedance changes with frequency. If the frequency at which a rated impedance has been measured is not specified, it is probably a typical value which is generally measured at 1,000 Hz.\*\*

Input impedance is also known as load impedance (the greater the load, the lower the impedance.) If an input has a higher impedance, it offers more "opposition" to the flow of audio than would a lower impedance input. Consequently, high impedance inputs do not draw as much power from the signal source which feeds (they are less of a load on the signal source). For example, if a given output has adequate power to drive just one low impedance input, it may be capable of driving five or more high impedance inputs.

Outputs impedance is also called source impedance. In most cases, an output can be connected only to an input whose load impedance is equal to or higher than the output's source impedance. For example, an output having a 600 ohm source impedance could be connected to an input having a 600 ohm load impedance or a 20,000 ohm or higher load impedance. When the input impedance equals the output source impedance, the input is said to be *matching* the output. When the load is approximately ten times the source impedance (or higher), the input is said to be *bridging* the output. This distinction is not critical, except in certain cases where the output must be bridged to avoid overloading or distortion. (In some passive equalizers, matching, not bridging, is required to preserve proper frequency response.) A typical example of a bridged output is a case where the source impedance is 2,000 ohms, yet the minimum load impedance is 20,000 ohms.

### Do not connect a high-Z output to a low-Z input.

Sometimes an output can be operated into a load of equal impedance (matching). It is seldom that an output can be operated into a load of lower impedance than the output's source impedance. For example, an output with a 2 kohm source impedance should not be connected to an input having a 600 ohm actual load impedance; distortion, and possible overheating and failure of the output circuit could occur.

### FIGURING IMPEDANCE WHEN ONE OUTPUT DRIVES TWO OR MORE INPUTS

When a "Y" adapter is used to feed two inputs from a given output, the combined input impedance seen by the output is actually *less* than the rated load impedance of either input alone. This places a greater load on the output. Rather than explain the formula to calculate actual impedance in these cases, we offer a simplified method. Assume that a Model 250 output is being connected to more than one high impedance input, and that each of those inputs has the same impedance, for example 20 kohms. Divide the input impedance (20 kohms) by the number of inputs to figure the actual load on the Model 250 output.

Thus, if the output is driving two 20 kohm inputs, the load is 10 kohms (20/2). If it is driving three 20 kohm inputs, the load is 6.7 kohms (20/3). If it is driving four 20 kohm inputs, the load is 5 kohms (20/4).

Since the maximum load (minimum impedance) recommended for the Model 250 is 5 kohms, the practical limit would be a 4-way split—if driving 20 kohm inputs. (Higher input impedances would allow more inputs to be driven, lower impedances would lessen the number of inputs that could be driven by a single Model 250 output.)

**CAUTION:** Do not connect two Model 250 outputs together. Also, except as specifically noted for track reassignment, do not connect Model 250 outputs directly to Model 250 inputs, as this could cause feedback.

### THE RELATIONSHIP BETWEEN IMPEDANCE AND LEVEL

We have discussed signal level and impedance separately, yet are they related? Yes, but not directly. Outputs which are rated at nominal +4 dBm line levels usually are capable of driving low or high impedance inputs (e.g., they can be matched or bridged). Outputs which are rated at nominal -10 dBV line levels usually are capable of driving only high impedance inputs (they must be bridged). This impedance/level relationship is not always the case; it is merely a common design practice.

Insofar as actual engineering design, there is no set relationship between high and low impedances and high and low levels. However, the maximum level available from a given output may be reduced when that output is connected to a low impedance input, compared to the level it will deliver to a high impedance input. For example, consider an output rated at "+15 dBV maximum into 10 kohms or more." Such an output might be useable with a 3 kohm load, although with such a load it might be reduced to a maximum level of +8 dBV. Be careful though—the same 3 kohm load could cause another similarly rated output circuit to fail altogether.

How many ohms constitute a high impedance? A low impedance? These terms are relative, and depend on the nature of the equipment and whether an input or output is

\* One kilohm (abbreviated kohm) equals 1,000 ohms.

\*\*Loudspeakers are an exception—there is no standard frequency at which impedance is measured; a speaker is usually rated close to its minimum impedance.



being described. The ranges cited below are approximate.

With microphones, *low* impedance refers to .50 to 250 ohms, whereas *high* impedance refers to 1 kohm or higher actual source impedance.

With line level outputs on mixers and accessory equipment, *low* impedance refers to actual source impedances of 10 ohms to 600 ohms, whereas *high* impedance refers to a 2 kohm or higher source impedance.

With line level inputs on mixers and accessory equipment, *low* impedance refers to actual load impedances of 600 ohms to 3 kohms, whereas *high* impedance refers to load impedances of 10 kohms to 100 kohms.

Speaker impedances typically vary from 3 to 16 ohms. The actual source impedance of a power amplifier's speaker output is often in the order of 1/10 of an ohm or less.

## SECTION 10 CLEANING AND DEMAGNETIZATION

### CLEANING

Magnetic recording tape, no matter how good in quality, will always shed some of its oxide coating as it travels past the tape guides and head assembly. Whenever a small particle of oxide (or dust, dirt, hair, etc.) comes between the head and the tape, audible performance can be degraded, especially at high frequencies. Regular cleaning of the tape heads and guides will avoid such losses and restore full fidelity.

If the oxide should be scraped off a portion of the tape backing, there will be a momentary loss of sound (a drop out). Drop-outs are permanent flaws in the tape, and must be avoided. Clean guides and heads are less apt to scratch the tape. This is another reason for routine cleaning.

Standard tape head cleaning solvents are available from most Fostex dealers. An ideal solvent consists of 100% pure isopropyl alcohol. Rubbing alcohol *should not* be used; even though it is isopropyl, it usually contains water and oils which will leave an unwanted residue after cleaning.

**CAUTION:** Never use organic solvents such as methyl-ethyl ketone (MEK), lacquer thinner, acetone, etc. These can dissolve the materials that bind the heads together, and, if spilled, can mar or deform plastic parts.

Wipe the heads, tape guides, pinch roller, and capstan with a common cotton swab, moistened with the head cleaning fluid or alcohol. Allow the parts to air dry before installing a cassette. (The process should be repeated until the swab no longer shows evidence of the reddish-brown oxide, and until the heads are shiny and clean.)

**NOTE:** We do not recommend the use of so-called head cleaning cassettes. These products typically use an abrasive tape which can prematurely wear the heads, and which does little to clean the capstan or pinch roller.

The exterior of the Model 250 can be wiped with a cloth that is moistened with a weak detergent and water solution. Do not use solvents, oils, waxes or spray-on cleaners.

### DEMAGNETIZATION

When a recording is made, the record/play head applies a powerful magnetic field to the tape. Iron oxide or similar magnetic particles in the recording tape store a portion of that magnetic field (this is the recording). It is a necessary law of physics that, as the recorded tape is subsequently played, some of the tape's magnetic field will be transferred to nearby metal parts. This residual magnetism is undesirable because it, in turn, can partially erase a tape. The purpose of demagnetization (degaussing) is to neutralize residual magnetism in the vicinity of the tape path.

Demagnetizing (also called degaussing) is accomplished by bringing a strong alternating magnetic field (created by a demagnetizer) near the head area, then withdrawing the field slowly. It is very important that this procedure be done carefully, and that no tapes be within 6 feet (2 meters) of the demagnetizer when it is operating. It is also important to turn off the Model 250 during the time the demagnetizer is turned on.









**CAUTION:** Demagnetizers are not dangerous devices, per se, but if used improperly they can instantly erase a valuable tape, and can permanently magnetize metal parts—the opposite of the desired result. NEVER TURN ON OR EVEN PLUG IN A DEMAGNETIZER UNLESS IT IS AT LEAST 3 FEET (1 METER) AWAY FROM THE Model 250. ALSO, NEVER TURN THE DEMAGNETIZER OFF UNTIL IT IS WITHDRAWN TO AN EQUAL DISTANCE OF AT LEAST 3 FEET. If the demagnetizer should be turned on or off nearby the Model 250, it may impart a magnetic charge to the heads or tape guides which is too strong to be removed by the same demagnetizer.

There is no rule as to how often demagnetization must be done, but we recommend it be performed at least once for every 10 hours of Model 250 record/play operation. We suggest observing the following procedure, step-by-step.

**NOTE:** Some demagnetizers do not have on/off switches, and must be plugged in and unplugged. This design may be safer because it avoids accidental switching when near the recorder. In these instructions, we assume that switchable demagnetizers are always turned on, and that power is controlled by plugging in or unplugging the unit from the AC mains.

1. Turn off the Model 250, and remove any cassette tapes to a distance of at least 6 feet (2 meters).
2. Before plugging in the demagnetizer, hold it at least 3 feet (1 meter) from the Model 250. Then plug it in.
3. Gradually move the demagnetizer toward the recorder until the tip is about 1/8-inch (3 mm) from the heads.
4. Slowly pull the demagnetizer away from the heads to a distance of about 3 inches (75 mm), then back to within 1/8 inch of nearby metal parts (tape guides, capstan, etc.) Continue this process until the demagnetizer has been waved near all parts in the tape path, but DO NOT TOUCH ANY OF THE PARTS WITH THE DEMAGNETIZER PROBE.
5. Gradually withdraw the demagnetizer until it is at least 3 feet (1 meter) from the Model 250. Then unplug the demagnetizer. This completes the demagnetization process.














Figure 19 Blank log sheet for reproduction

TAPE No.:		SONG/TITLE:		START DATE:		END DATE:		NOTE ALL PERFORMERS ON BACK OF THIS SHEET	
INITIAL TAKE & OVERDUBS									
REF. NO.	TAPE INDEX COUNT	PROGRAM ON EACH TRACK OF TAPE				COMMENTS/NOTES			
		TRACK 1	TRACK 2	TRACK 3	TRACK 4				
		  RECORD TRACK	  RECORD TRACK	  RECORD TRACK	  RECORD TRACK	RECORD TRACK SELECTOR SETTINGS FOR INITIAL TRACK ASSIGNMENT.			

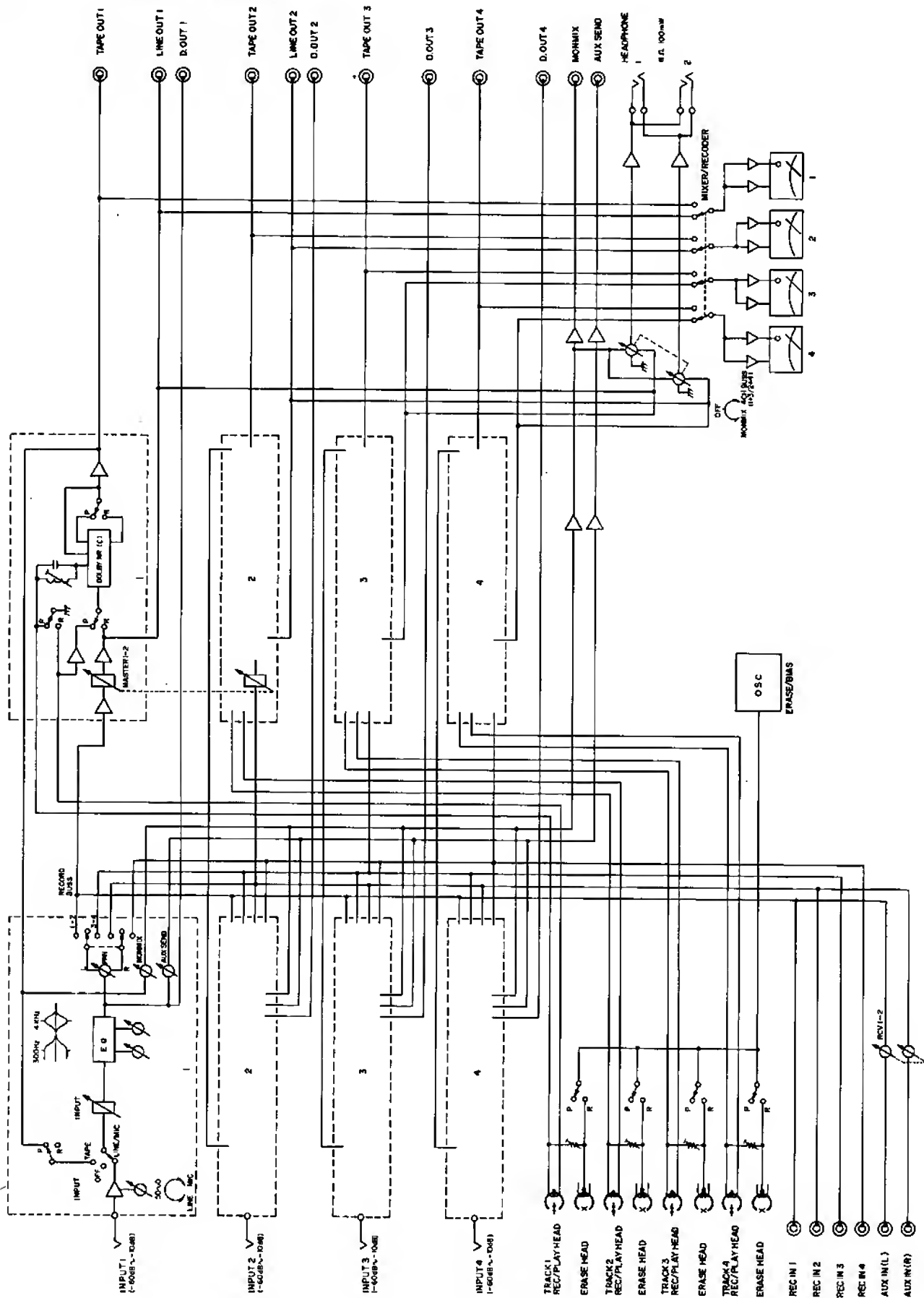
  

TRANSFERS/TRACK COMBINATION						
REF. No.	INDEX COUNT	PROGRAM TRANSFERRED ONTO EACH TRACK OF TAPE				COMMENTS/NOTES
		TRACK 1	TRACK 2	TRACK 3	TRACK 4	

SETUP FOR REMIX TO STEREO (OR MONO)							
TRACK No.	CHAN. FADER	EQUAL		2 CHAN (1-2) PAN	EFFECTS PATCH AUX OUT- ? -AUX	AUX RCv	COMMENTS
		300	4K				
					LEFT		
					RIGHT		
							
							

## SECTION 11



## SECTION 12 SPECIFICATIONS

<b>MIC/LINE INPUT (X4)</b>	
Mic Impedance	10K $\Omega$ or less
Input impedance	50K $\Omega$
Nominal Input level	Mic: -60dBV (1mV) Line: -10dBV (0.3V) -66dBV (0.5mV) +12dB (4V)
Minimum Input level	
Maximum Input level	
<b>4 CHAN REC IN (X4)</b>	
Input impedance	20K $\Omega$
Nominal Input level	-10dBV (0.3V)
Maximum Input level	+8dBV (2.5V)
<b>AUX IN (X2)</b>	
Input Impedance	20K $\Omega$
Nominal/minimum Input level	-10dBV (0.3V)
Maximum Input level	+20dBV (10V)
<b>AUX SEND/MONMIX OUT</b>	
Output load Impedance	10K $\Omega$ or more (5K $\Omega$ minimum)
Nominal output level	-10dBV (0.3V)
Maximum output level	+15dBV (5.6V)
<b>DIRECT OUT (X4)</b>	
Output load Impedance	10K $\Omega$ or more (5K $\Omega$ minimum)
Nominal output level	-10dBV (0.3V)
Maximum output level	+15dBV (5.6V)
<b>TAPE CUE OUT (X4)</b>	
Output load Impedance	10K $\Omega$ or more (5K $\Omega$ minimum)
Nominal output level	-10dBV (0.3V)
Maximum output level	+8dBV (2.5V)
<b>HEADPHONE OUTPUT (Stereo)</b>	
Load Impedance	8 $\Omega$ or more (4 $\Omega$ minimum)
Maximum output	100mW at 8 $\Omega$
<b>EQUALIZER</b>	
4 KHz	Variable $\pm 12$ dB, peaking
300 Hz	Variable $\pm 12$ dB, shelving
<b>RECORDING TAPE</b>	Compact cassette, C-60 or C-90. Use a gamma-ferric oxide tape that requires high bias level and 70 microsecond EQ (TDK SA, MAXELL XL-II or equivalent)
<b>RECORD TRACKS</b>	4 track, one direction (Special format)
<b>RECORD CHANNELS</b>	4 with Dolby NR C-type in encode mode throughout (encode/decode switchable)
<b>PLAYBACK CHANNELS</b>	4 with Dolby NR* C-type in decode mode throughout (encode/decode switchable)
<b>NORMAL TAPE SPEED</b>	3-3/4 ips, $\pm 1\%$
<b>PITCH CONTROL</b>	$\pm 10\%$ of normal tape speed
<b>RECORDING TIME</b>	15 minutes for C-60
<b>HEADS</b>	4 channel erase (ferrite) 4 channel record/playback (Permalloy)
<b>MOTORS</b>	One FG servo controlled DC capstan motor and one DC reel motor.
<b>FAST WIND TIME</b>	80 seconds for C-60

<b>FREQUENCY RESPONSE</b>	
Mixer section	20Hz ~ 20,000Hz $\pm 1$ dB
Recorder section	20Hz ~ 18,000Hz (40Hz ~ 14,000Hz +2dB, -3dB at 0 VU)
<b>TOTAL HARMONIC DISTORTION</b>	
Mixer section	0.05% at 1,000Hz, nominal level
Recorder section	1.5% at 315Hz, 0 VU level (Overall)
<b>S/N</b>	
Mixer section	One mic in overall—65dB weighted, 62dB unweighted One line in overall—75dB weighted, 72dB unweighted
Recorder section	75dB weighted, 65 dB unweighted
<b>CROSSTALK</b>	
Mixer section	65dB at 1,000Hz
Recorder section	50dB at 1,000Hz
<b>ERASURE</b>	70dB at 1,000Hz
<b>POWER REQUIREMENTS</b>	120V AC, 60Hz, 35W (U.S.A./Canada models) 220V AC, 50Hz, 35W (European models) 240V AC, 50Hz, 35W (UK/Australian models) 100/120/220/240V AC, 50/60Hz, 35W (general export models)
<b>DIMENSIONS</b>	430 x 80 x 355mm (17 x 3-1/8 x 14 in.)
<b>WEIGHT</b>	Net 8.5 Kg. (19 lbs.) Shipping 9.5 Kg. (21 lbs.)

Specifications subject to change without notice.

\*Dolby is the registered trademark of Dolby Laboratories, Inc., San Francisco, CA.

**Fostex**

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